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ABSTRACT

The nature and current status of knowledge about occupational adaptability and transferable skills are summarized in this report. It is a synthesis of major conclusions and insights, with some additional perspectives, from eight final reports on an exploratory study (see Note). A brief overview is presented of project objectives and activities which focused on identification of skills, attitudes, knowledge, and personal characteristics that schools could seek to develop, and how they might teach them to prepare students for careers characterized by change. The several conclusions include the following: (1) The substantial job changing in the American labor force is neither inherently good nor bad. (2) Individuals need help in preparing for careers characterized by change. (3) Although little is known about job changing, skills alone do not determine mobility or adaptability. (4) All skills are potentially transferable to some extent and on some occasions. There is reasonable consensus on broad categories important for success in a variety of occupations. (5) Students need opportunity to practice application of skills under a wide variety of conditions and circumstances. (6) Performance in one talent area is unrelated to that in others, so schools should develop abilities in a number of different ones (e.g., creative, decision-making, planning, and communication talents). (7) A number of educational programs and instructional techniques have been identified that seem to provide for the implicit recognition or development of transferable skills. Suggestions and recommendations are made for teachers, counselors, administrators, employers, and researchers. Examples of transferable skills and characteristics and the final report of the project's panel of consultants are appended. (JT)

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OCCUPATIONAL ADAPTABILITY AND TRANSFERABLE SKILLS

Project Final Report

Frank C. Pratzner

CE 025 306

The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, Ohio

January 1978

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
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FOREWORD

This report describes something of the nature and current status of our knowledge about a set of ideas with important educational implications—occupational adaptability and transferable skills. It summarizes and highlights some of the questions and major conclusions about these concepts that have emerged from a recent Center project. Rather than merely reiterate substantial portions of what has already been written in other project reports, this summary attempts to weave together major conclusions and insights with some additional perspectives.

Full reports of each of the major project tasks are listed and described briefly inside the back cover. The reader is encouraged to acquire and read each report for a fuller discussion and understanding of many of the points touched on here.

If this summary stimulates enthusiasm and interest in further inquiry about a problem, or pursuit of a particular idea, it has been successful. If it stimulates significant irritation and disagreement, or if serious questions are raised about the reasonableness or validity of some of its ideas, or about the lack of information or insight on some issues, it has also been successful.

The Center is indebted to many individuals and agencies for their help and participation in the project. In particular, we would like to express our deep appreciation to the dedicated and hard working staff of the project: Harry Ammerman, William Ashley, Richard Miguel, Frank Pratzner, and Allen Wiant. We also appreciate the support provided by Winston Horne, Duane Essex, Sue Keith and Keith Widaman on various project tasks and activities, and the secretarial and clerical assistance provided by JoAnn Neefe, Roxann Johnson, and Saundra DeLong.

Special gratitude and appreciation is extended to the project's Panel of Consultants: Marcia Freedman, Jerome Moss, Jr., Calvin Taylor, and to Robert Stump, Project Officer of the National Institute of Education, for their sustained assistance and many significant contributions throughout the conduct of the project.

Finally, we would like to thank the several authors of project reports, the consultants and reviewers of the project work, and the many representatives of business, industry, and education programs who generously contributed their time and insights to the project.

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SUMMARY

Examination of occupational adaptability and transferable skills has lead the project to several conclusions.

1. Available evidence suggests that there is substantial mobility in the American labor force. However, job changing is neither inherently good nor bad; it's simply a significant feature of modern American life.

2. The idea that one set of occupational skills can be learned once and should last a lifetime does not seem to be valid. Thus, there is a need to help individuals at any age to prepare not only for a job, but for work careers characterized by change.

3. Surprisingly little is known about job mobility and job changing. However, skills alone do *not* determine mobility or adaptability. A variety of other factors such as union controls, personal career considerations, and conditions of the labor market seem to be important. We know little about the relative importance or influence of these factors on mobility and adaptability.

4. Schools cannot prepare students for all unknown future contingencies. But it does seem reasonable to expect them to help students develop their individual attributes, potentials, or capacities to levels of proficiency useful in a wide range of situations. By such development they may be adaptable and better able to perform successfully in changing environments.

5. Having transferable skills will *not* guarantee successful adaptability, but should facilitate it. To the extent that individuals perceive similarities among jobs and are able to transfer their skills and knowledge effectively, the time and costs associated with supplemental training or retraining should be reduced and reflect a savings to employers and individuals alike.

6. All skills are potentially transferable to some extent and on some occasions. It was relatively easy to find existing examples of multiple-use, generally applicable skills and personal characteristics. There also appeared to be some reasonable consensus about a number of broad categories of skills, knowledge, and personal characteristics that are important for success in a variety of occupations and other life settings. Nevertheless, there does *not* appear to be a single agreed upon list of specific skills and personal characteristics generally applicable across a broad range of settings.

7. Because *all* skills are potentially transferable, the process of transfer, and especially teaching for transfer, is of paramount importance. The literature and research in this area provides little explicit guidance, and few recommendations for practice can be made with confidence. Nevertheless, it seems desirable to provide students with opportunities to practice the application and use of skills and knowledge under a wide variety of conditions and circumstances; transfer should be a deliberate and explicit objective of all instruction;

and students should be informed or made aware of the multiple uses and applications of their skills and knowledge.

8. A great many human talents, attributes, or capacities have been identified. Often schools have focused almost exclusively on development of academic talents and have ignored other types of talents. Because each type of talent is important, and research has shown that performance in one talent area is essentially unrelated to performance in other areas, schools should make deliberate efforts to develop abilities in a number of different talent areas (e.g., creative talent, decision-making talent, planning talent, communication talent).

9. A number of educational programs and instructional techniques have been identified that seem to provide for the implicit recognition or development of transferable skills.

Based upon consideration of occupational adaptability and transferable skills, the project would offer the following suggestions or recommendations to each of several key audiences.

Teachers. The development of transferable skills and transfer skills probably cannot be accomplished effectively if they are the objectives, special interest, or special ability of only one or two teachers or courses in a school. The project's contention is that their effective development can only be accomplished if they are pervasive and deliberate objectives for an entire school program.

Work with your colleagues in the same school to discover and better understand the objectives you have in common. Focus on the multiple use, generally applicable skills, knowledge, attitudes, and personal characteristics you are all trying to develop, regardless of the subject matter being taught. Focus on the similarity of objectives *not* the differences in subject matter.

Counselors. Help students become more aware of and better informed about their own skills, knowledge, attitudes, and personal characteristics. Help them understand that their skills may be applied in many different contexts and occupations. Look for and encourage development of student assessment materials and career counseling materials that cluster, relate, and describe occupations on the basis of commonalities in skill and other personal requirements, rather than on the basis of such factors as job titles and industry.

Administrators. Encourage teachers and counselors to identify and list the similar skills and knowledge they are trying to develop, regardless of subject matter being taught. Foster inquiry and concern among faculty, students, staff, parents, and employers about occupational change, transferable skills, and the relevance of what is taught. Encourage and facilitate a variety of settings for learning and conditions for skill and knowledge application, and facilitate use of a variety of teaching/learning and assessment techniques in order to develop and use a wider range of student abilities or talents. Examine alternative ways of recording or keeping track of student development of skills, knowledge, attitudes, and personal characteristics. Work with the community and employers to develop alternatives or supplements to diplomas, degrees, and certificates that more effectively describe student capabilities and achievement.

Employers. When considering individuals for new positions, be critical of the measures used to determine whether a person is suitable both for an initial position and for promotability. Current employees may be able to adapt readily to a variety of jobs. Be especially sensitive to the fact that job applicants and employees often have developed a variety of skills through means other than formal education and training or through previous employment. Work toward development of better analyses, assessments, and descriptions of the skill and knowledge requirements of occupations. Help schools identify occupationally transferable skills, knowledge and personal characteristics that have relatively broad applications and use.

Researchers. In addition to the several suggestions noted in the last section of the report (p. 30), two broad problem areas are of high priority. First, basic information is needed to develop alternative ways to assess achievement and the ability to transfer or apply skills and knowledge in various settings. Second, basic information is needed about occupational change and mobility. Especially important is the need for basic information about the relationships of individual skills and abilities to job requirements and individual occupational change. New and innovative ways are needed to use available longitudinal data about workers and job mobility to better understand the relative importance and influence of individual attributes in job changing and occupational adaptability.

PURPOSE AND NATURE OF THE PROJECT

Background

This study grew out of concern for the work experience of the average American adult today in which job mobility is a significant phenomenon. Many people change their jobs either voluntarily or involuntarily, and the young do so more frequently.

Obviously, schools cannot prepare students for all unknown future contingencies. But it does seem reasonable to expect them to help students develop their individual attributes[1] to levels of proficiency useful in a wide range of jobs so that they may be occupationally adaptable and better able to perform successfully in new jobs when a change is desirable or necessary, or as their own jobs change over time.

While the notions of occupational adaptability and transferable skills have proven to be intuitively appealing, they are *not* well understood. This project was an initial exploratory study to estimate the current state-of-knowledge and to gain a better understanding of the nature of occupational adaptability and transferable skills.

The project's several activities focused on identification of the skills, attitudes, knowledge, and personal characteristics that schools could seek to develop, and how they might teach them to prepare students for work careers characterized by change. The ultimate goal was to provide information and knowledge to improve the capability of schools to plan and produce curricula, instructional materials, teaching methods, and experiences aimed at increasing student awareness of the potential adaptability of their acquired skills and the development of individual occupational flexibility and versatility.

Overview of Objectives and Activities

The project was conducted between February 1976 and October 1977 by the National Center for Research in Vocational Education at The Ohio State University, under a contract from the Education and Work Group of the National Institute of Education. The project's several activities were like a fishnet. They explored many aspects of the current state-of-knowledge, each of which was expected to help in better understanding occupational adaptability and transferable skills.

One approach of the project was an examination of available literature and research on the characteristics of jobs that are considered common. Many different schemes are available to classify and put jobs into groups such as those based upon similarities of skill and ability requirements, temperaments, and working conditions. For example, the *Dictionary of Occupational Titles* classifies jobs in a number of ways and puts them into several different groups.

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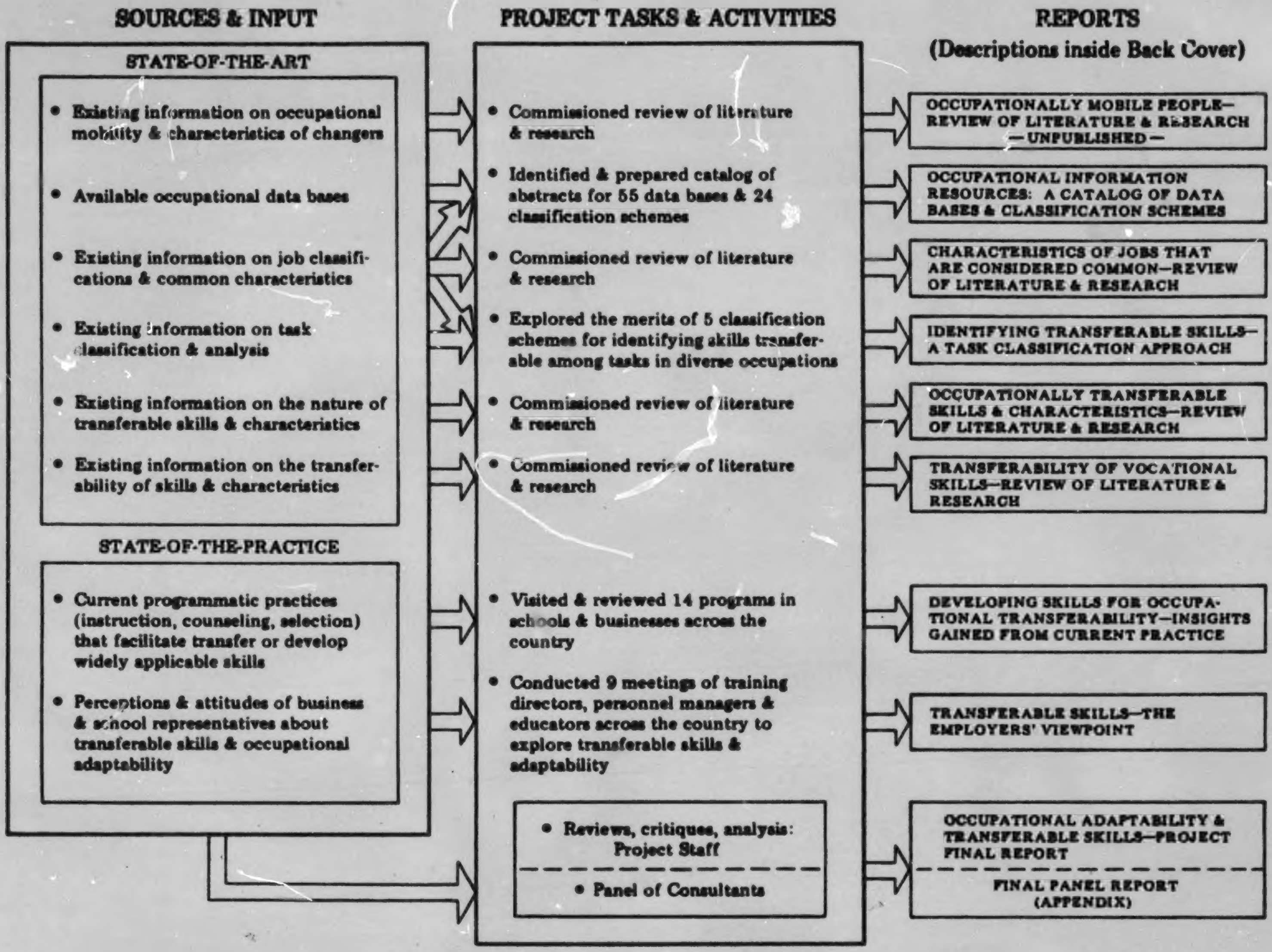
[1] Throughout the report the word *attributes* and sometimes the word *skill* have been used to refer collectively to the skills, knowledge, attitudes, and personal characteristics possessed by individuals.



SOURCES & INPUT

STATE-OF-THE-ART

- Existing information on occupational mobility & characteristics of changers
- Available occupational data bases
- Existing information on job classifications & common characteristics
- Existing information on task classification & analysis
- Existing information on the nature of transferable skills & characteristics
- Existing information on the transferability of skills & characteristics

STATE-OF-THE-PRACTICE

- Current programmatic practices (instruction, counseling, selection) that facilitate transfer or develop widely applicable skills
- Perceptions & attitudes of business & school representatives about transferable skills & occupational adaptability

PROJECT TASKS & ACTIVITIES

- Commissioned review of literature & research
- Identified & prepared catalog of abstracts for 55 data bases & 24 classification schemes
- Commissioned review of literature & research
- Explored the merits of 5 classification schemes for identifying skills transferable among tasks in diverse occupations
- Commissioned review of literature & research
- Commissioned review of literature & research
- Visited & reviewed 14 programs in schools & businesses across the country
- Conducted 9 meetings of training directors, personnel managers & educators across the country to explore transferable skills & adaptability
- Reviews, critiques, analysis: Project Staff
- Panel of Consultants

REPORTS
(Descriptions inside Back Cover)

OCCUPATIONALLY MOBILE PEOPLE—REVIEW OF LITERATURE & RESEARCH —UNPUBLISHED—

OCCUPATIONAL INFORMATION RESOURCES: A CATALOG OF DATA BASES & CLASSIFICATION SCHEMES

CHARACTERISTICS OF JOBS THAT ARE CONSIDERED COMMON—REVIEW OF LITERATURE & RESEARCH

IDENTIFYING TRANSFERABLE SKILLS—A TASK CLASSIFICATION APPROACH

OCCUPATIONALLY TRANSFERABLE SKILLS & CHARACTERISTICS—REVIEW OF LITERATURE & RESEARCH

TRANSFERABILITY OF VOCATIONAL SKILLS—REVIEW OF LITERATURE & RESEARCH

DEVELOPING SKILLS FOR OCCUPATIONAL TRANSFERABILITY—INSIGHTS GAINED FROM CURRENT PRACTICE

TRANSFERABLE SKILLS—THE EMPLOYERS' VIEWPOINT

OCCUPATIONAL ADAPTABILITY & TRANSFERABLE SKILLS—PROJECT FINAL REPORT

FINAL PANEL REPORT (APPENDIX)

Figure 1. Overview of the project.

It wasn't known whether previous work on job classification had shed any light on the nature of occupationally transferable skills and characteristics. Of greatest interest was whether the skills and personal characteristics representative of jobs within a job cluster were transferable among those jobs and whether they were more transferable within groups of similar jobs than they were across different job groups. If so, it was hoped that valuable information and clues could be obtained for the planning and development of effective guidance and instructional programs. Bruce McKinlay, Associate Dean of the School of Community Service and Public Affairs, University of Oregon, was commissioned to review the literature and research and prepare a report on what was known about the characteristics of jobs considered common.

While much of the literature on occupational change and mobility seemed to contain job and demographic information, it wasn't known whether occupationally mobile people could be distinguished reliably as a group from non-mobile people, especially in terms of their skills, personal characteristics, and educational and training experience, or whether some types of occupations had characteristically higher rates of mobility than other types. It was felt that such information about the skills, personal characteristics, and educational experiences of occupationally mobile people, as well as information about occupations with high rates of worker mobility, could provide valuable insights about the nature of occupationally transferable skills and clues for the development of effective guidance and counseling programs, curricula, and instructional methods and materials.

Thus, one of the things the project set out to do was to review the available literature and research on occupationally mobile people to see if the kinds of questions raised above could be answered on the basis of available evidence. If so, subsequent projects could begin to move toward development of practical applications of such information for educational and occupational preparation. If *not*, subsequent studies could be designed to obtain answers to such questions. George Parsons, Assistant Professor of Guidance and Counseling, University of Cincinnati, was commissioned to review available literature and research and prepare a report on what was known about the characteristics of occupationally mobile people.

Originally the project also intended one review of available literature and research related directly to the nature of occupationally transferable skills and characteristics. As it turned out, this required two separate reviews; one that attempted to identify what was known about the nature of transferable skills and characteristics; the other that reviewed current knowledge about the processes of skill transfer and the factors that inhibit or facilitate one's ability to transfer or apply acquired skills in different situations. Douglas Sjogren, Professor of Education, Colorado State University, was commissioned to prepare the review of literature and research on skills that are transferable, while James Altman, an industrial psychologist and President of Synectics Corporation, Allison Park, Pennsylvania, prepared the review on the skills of transfer.

The project staff selected and visited 14 diverse operating programs in schools, businesses, and industries in an attempt to identify and examine current practices that implicitly or explicitly demonstrated recognition of the transferability of skills. The staff also held a series of nine meetings across the country with small groups of educators, union representatives, personnel managers, and training directors from a variety of businesses and industries to discuss their views, reactions, and current practices relative to the nature of transferable skills, worker selection, training, transfer, and job progression.

Supplementing this work, the project set out to abstract and prepare a catalog of data bases and classification schemes that contained information relative to occupational mobility and skill transfer. This, it was felt, would be a valuable resource and could be used subsequently by many different individuals and agencies to expedite research and development on a variety of questions related to individual career preparation.

Finally an initial examination was made of the usefulness of job tasks as a basis for studying occupationally transferable skills, to see if this approach had merit. Several ways of classifying job task-elements were investigated to develop some initial insights into their potential use for the identification of general skill relationships among jobs.

These various activities were the substance of the project. This report does not summarize the findings of each of these tasks. Separate reports are available for readers interested in any or all of these efforts. Rather, this report attempts to look analytically at many substantive issues that arose during project activities.

DISCUSSION

The project was an exploratory study. The ideas, conclusions, and implications discussed here are, therefore, tentative and somewhat speculative. Although they represent the considered opinions and judgments of the researchers, each lacks definitive research results. For this reason they should be treated cautiously. Nevertheless, where possible and reasonable, educators and researchers are encouraged to pursue these insights and to use them in practice.

Occupational Change

The project's concern for transferable skills and occupational adaptability was related to occupational change or mobility, that is, to the actual movement of workers from one type of job to another. Of special interest were job changes such as interfirm, industrial, or occupational changes (Parnes, 1968) that resulted in substantial differences in the work performed or in different performance requirements. Major shifts in employment or changes in occupations appeared to require major adjustments or adaptation in performance, and it was here that the transfer and application of skills and personal characteristics was thought to be an important consideration.

Substantial evidence is available to document the mobility of the American labor force today. One Census Bureau study found that more than 10 million people changed occupations and/or employers in a single 12-month period. This constituted 15% of those employed at both the beginning and end of the period (Byrne, 1975). Another found that almost 1/3 of the working public had a different occupation in 1970 from the one they had in 1965. Only 47% of men and 40% of women with jobs in 1965 had the same occupation in 1970 (Sommers & Eck, 1977). More often than not, change in occupation entailed change in major occupational group, for example, from sales person to management or vice-versa. Moreover, rates of occupational change are likely to continue or increase in both good and bad economic times because of the demands of technological change.

In addition to the fluidity or mobility of the labor force, high rates of unemployment persist, while at the same time, significant numbers of job positions are empty and available.[2] In Milwaukee, for example, a number of major manufacturers, concerned about an apparent shortage of skilled labor, recently commissioned a study to evaluate the problem (Udell, Strange, & Parke, 1977). The study found that similar skill shortages existed in other cities and that, to cope with the problem, some employers were investing heavily in training programs in an attempt to alleviate long-term shortages.

Whereas 14 of every 20 people retiring nationally are blue-collar workers, only 9 of every 20 entering the labor force seek blue-collar work. In line with this trend, only 1/4 of Milwaukee's high school students indicated a preference for blue-collar work in 1975, and only 2.5% selected factory production work. Instead, students overwhelmingly preferred more glamorous white-collar jobs for which few openings existed. Whereas the number of annual job openings nationally for welders is about equal to the total openings for a number of the white collar jobs (e.g., pilots, radio-TV announcers, photographers, architects, interior decorators, and physical therapists), those desiring these occupations outnumbered the would-be-welders by a ratio of 18-to-1. This in spite of the fact that skilled workers in the Milwaukee labor force were reported as generally feeling that their work offered variety, interest, challenge, and opportunity to learn, as well as economic benefits.

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[2] In some cases, employment opportunities may be concentrated in one part of the country while available workers may be concentrated in other parts. Sex, age, and race discrimination, lengthy training requirements, unacceptable, dehumanizing, or unsafe job conditions, and low wages or poor benefits are additional factors that may account for some job positions remaining empty in spite of available workers.

Under these kinds of labor market conditions, education programs will have to concern themselves with improving the ability of individuals to make career changes and develop capacity to assist them in making these changes. Job changing is neither inherently good nor bad; it has simply become a significant feature of modern American life. The idea that one set of occupational skills can be learned once and should last a lifetime seems to have lost whatever validity it may have had in this country. Thus, the concern and need is *not* the discovery of ways to foster or discourage job mobility, but a concern for helping students prepare *not* only for a job, but for work careers characterized by occupational change.

Because individual job mobility can be expected to remain a significant feature of contemporary life, the ability of employers to identify and match people effectively with available jobs is extremely important. However, in meetings with employers, personnel managers, and training directors representing a broad spectrum of large and small firms, the general feeling was that: (a) assessment techniques for employment and promotion are crude, (b) many employers are having little consistent success in effectively assessing job applicants for immediate openings, training, or future potential, and (c) credentials typically furnished by schools are of limited practical value to prospective employers (Wiant, 1977).

Several studies cited by Sidney Fine (1957a) supported his conclusion that:

> Only a minority of firms today, and those usually the larger ones, engaged in job analysis to the point of having an analysis of requirements and qualifications. Obviously, if there is no clear statement or recognition of what is wanted, it is unrealistic to talk about similarities of skills. Furthermore . . . where employee screening and selection is effected by a personnel office, even in firms that have job specifications, the final say as to hiring may be in the hands of a supervisor or foreman who may reject the candidate . . . for any of many reasons . . . and the true reason, in some cases, may not be related to the job specifications (p. 807).

By and large, these conditions prevail 20 years later. For instance, only a few of the employer internal transfer policies mentioned in the project meetings were characterized by a significant expenditure of effort on occupational analysis, validation of aptitude requirements, and the development of achievement tests (Wiant, 1977, p. 15).

The recently devised *Guidelines on Employee Selection Procedures* (Equal Employment Opportunity Commission, 1976), are designed to eliminate the kind of abuse noted above by Fine when it results in unfair hiring practices. The *Guidelines* require empirical analysis and evidence that skills and capabilities sought in employees (new applications or applications for transfer) are directly relevant to specific job requirements. Thus, operating within the *Guidelines* conceivably could pose significant new problems and additional barriers to the adequate and appropriate consideration of transferable skills and occupational adaptability. For instance, it is *not* now entirely clear how to acceptably assess or estimate skills or other individual attributes that may *not* be required by an immediate job, but that may be required subsequently for cross-training in a related occupation. Also, it is more difficult to show clearly that widely useful but ordinarily ill-defined attributes (such as, for example, integrity, initiative, and decision making) are as directly related to the successful performance of a set of job tasks as are other more technical trade skills. (For a discussion of several issues relevant to the impact of the *Guidelines*, see Wiant, 1977, p. 17.)

Equally important for education and work programs was the finding that surprisingly little is known about job mobility and job changing. When is a job change a significant change? How much of occupational mobility reflects a significant change in the work performed? How much merely reflects a change of employers with little actual change of work performance requirements? Answers to such questions are largely lacking and hinder efforts to provide more effective educational programs responsive to individual needs for career planning, preparation, and progression. Especially important is the lack of evidence about the factors that may contribute to or inhibit mobility, and the relative importance of skills and other personal characteristics to occupational change.

McKinlay (1976) pointed out that,

> Direct measurement of transfers is extremely difficult because [such measurement] requires longitudinal cohort analyses, which are both expensive and time consuming. Also, there is the possibility that patterns of occupational transfer differ from one area to another. At present we have only crude definitions and quantative measures of occupational transfers, and we have barely begun to analyze their significant determinants (p. 2-3).

Dixie Sommers and Alan Eck (1977) noted that,

> Occupational mobility is an important but relatively unexplored fact of labor market behavior and of the supply and demand structure of occupations. . . . Because of its complexity, occupational mobility has been one of the more difficult types of labor force behavior to quantify (p. 3).

Descriptive studies of the nature and amount of mobility in the labor force are beginning to become available and they can make important contributions to our overall information about and understanding of mobility. In addition to descriptive studies, however, new approaches to research and development are needed that focus explicitly on the implications of mobility for education and training.

For example, it can be hypothesized that occupational change may involve changes or differences in the methods, content, or context of work. Figure 2 notes examples of each possible type of change in methods-content-context. It can be seen that these three characteristics can be *essentially the same* between two occupations, or they can be *quite different* between occupations.

Researchers interested in the study of mobility are encouraged to develop and examine the use of such schemes as a starting point for investigations of possible distinctions between significant changes in occupations and job performance and those that are not significant. For instance, existing or new data on occupational change (e.g., titles of jobs held at two different times) might be re-examined to determine (a) when a change represented a significant change (as defined by various classification schemes), (b) the proportion of significant changes to all occupational shifts by a particular sample within a cohort, and (c) other factors correlated with significant job changes that may help to explain differences between job performance requirements and the relative importance of skills and personal characteristics in significant job change.

METHODS USED (Tasks, Activities)	CONTENT DOMAIN (Concepts, Objects Acted upon)	CONTEXT (Work Situation)	EXAMPLES
Same	Same	Same	a. Change in rank from Junior Programmer, to Programmer, to Senior Programmer.
			b. Change in rank from Associate Professor to Professor.
			c. Clerk-Steno III to Secretary I.
Same	Same	Different	a. Design Engineer for government research, to Design Engineer for consumer product production, same employer.
			b. Navy Cook (retired) to Institutional Cook (civilian).
Same	Different	Different	a. Aerospace Systems Analyst for training requirements of new equipment, to Systems Analyst for Public Vocational Education Systems.
			b. Medical Secretary to Legal Secretary.
			c. Business Data Programmer to Scientific Data Programmer.
Same	Different	Same	a. Secondary English Teacher to Secondary Social Studies Teacher.
			b. Flying Instructor (single-engine prop) to Flying Instructor (2-engine jet).
			c. Truck Driver (light panel) to Truck Driver (heavy tractor-trailer).
Different	Same	Same	a. Skilled Craftsman to Foreman.
			b. Secondary Teacher to Assistant Principal.
Different	Different	Same	a. Progress upward through key rungs of career ladder, from Orderly, to LPN, to RN, to MD Intern.
			b. Flight Engineer to Commercial Pilot.
			c. Bricklayer (house construction) to Real Estate Agent.
Different	Same	Different	a. Liberal Arts Major in Psychology to Salesman.
			b. Business Major to Auditor.
Different	Different	Different	a. Liberal Arts Major in Philosophy to Broker.
			b. Housewife to Riveter.
			c. Electronics Technician to Developmental Psychologist.

Figure 2. Example of changes in job methods, content, and context.

To encourage and facilitate such investigations, the project has compiled a catalog of existing data bases and classification schemes (Ashley, 1977). The catalog can be a useful resource for the development of alternative approaches to the investigation of occupational change and mobility. It provides a quick and concise reference to the content of 55 existing and diverse occupational data bases and 24 classification schemes. Abstracts of each data base and classification scheme include such information as: identification, investigator, location, documentation, access, design information, subject variables, occupational variables, and organization variables. It is strongly recommended to researchers and other readers interested in occupational mobility.[3]

Occupational Adaptability

Many ideas related to occupational adaptability and transferable skills are *not* new. It is, therefore, surprising and difficult to explain why so little seems to have been done to better understand and apply the concepts.

At any rate, 20 years ago, in his "reexamination" of the concept of the transferability of skills, Sidney Fine (1957a) provided a definition that seems to apply equally well to what is referred to here as occupational adaptability:

> The movement of workers with certain knowledges and abilities from one job to another . . . making possible the continuous use of developed knowledges and abilities (p. 803).

More recently, Douglas Sjogren (1971) defined an adaptable individual as one who can generalize, transfer, or form associations so that the skills, attitudes, knowledge, and personal characteristics that have been learned or developed in one context can be readily used in a different context.

While it seems apparent that everyone has skills that are transferable, it is equally apparent that some people are more occupationally mobile and adaptable than others. The explanation for differences in adaptability remains an important unsettled issue. However, part of the explanation appears to be related to differences in individual awareness of one's own skills and abilities.

It seems to be a sad fact that a great many people don't really know a great deal about their own attributes and their level of development. Most probably have *not* taken complete stock or tried to enumerate their personal repertoire of skills, knowledge, and personal characteristics, nor the level of their development.

Lack of self-knowledge or self-awareness can be a significant barrier to adaptability. Schools could make a significant contribution by making deliberate efforts to help students better understand and become aware of their skills, knowledge, and personal characteristics and their levels of development (see also, Miguel, 1977). McKinlay (1976) suggested that "developmental exercises and information must be provided so people can clarify their understanding of their own preferences and abilities, and relate them to career opportunities" (p. 49). Moreover, McKinlay concluded from his review of literature and research that:

> Worker trait research clearly indicates that education should enable students to understand their own abilities and preferences . . . such self-understanding can also identify developmental needs in areas ranging from physical strength to decision making (p. 17).

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[3] Full information for ordering the catalog (Information Series No. 104), and any of the other project reports, is included inside the back cover.

The correspondence between the level of development of an individual's skills, related knowledge, and personal characteristics, and the level of development required for job performance partly describes one's potential for successfully adapting to a particular job. The conditions for job performance, the organizational climate, work environment, the job conditions under which skills are used, and an individual's prior experience in applying personal and other attributes under a range of conditions may affect one's adaptability. In many cases, work environments or the conditions for job performance, suggest that other kinds of skills, knowledges, and/or attitudes, such as social skills, knowledge of work routines, and high levels of toleration for repetitive tasks, may be more important than specific technical skills.

For example, Marcia Freedman (1976) pointed out that "all jobs require a degree of socialization, in the sense that the new worker has to become accustomed to [or adapt to] the habits, mores, and routines of the workplace and the work groups" (p. 92). She further reminds us that there are a great many occupations for which specific technical skills are minimal and no vocational preparation is required. Thus, in automobile or electronics assembly lines, very little technical learning is required, and

> adequacy is more a matter of tolerating the work and becoming conditioned to performing repetitive tasks day after day than it is a matter of acquiring [technical] skills (p. 92).

Also, studies of the transitions of aerospace engineers to employment outside of the aerospace industry show that the organizational climate or conditions in a new work environment, such as for example, the age or sex of supervisors, may have significant and differential effects on adaptability and adjustment (Rittenhouse, 1967). McKinlay (1976) has suggested that "the area of the work environment, defined to include social and organizational aspects as well as the physical surroundings, seems a promising area of study of job changes, including occupational transfers" (p. 35).

Adaptability and Training Needs

It seems reasonable that the lower the correspondence between individual attribute development and job requirements, the less transfer of skills expected, and the more likely it is that supplemental training will be required. In other words, an adaptable person is one who, in general, possesses appropriate skills and is able to transfer or apply them effectively to performance in a new job with a minimum of supplemental training.

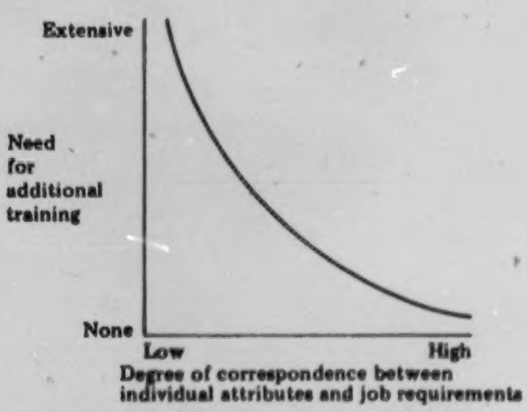

Figure 3. The relationship of transfer to training.

Thus, for example, in the case of a retired Navy cook becoming a cook in a civilian institution, the potential for successfully adapting to the new job situation with minimum retraining is expected to be good because, in general, (a) the degree of correspondence between the skills, related knowledge, and other personal requirements of the two jobs is likely to be high; that is, the individual attributes gained in or required by the first job are similar to those required by the second, and (b) the degree of correspondence between the conditions for performance expected by both jobs is likely to be reasonably high; that is, the work context or conditions for performance in the second job, while different, are expected to be very similar to those in the first job.

However, in the more extreme case of an electronics technician becoming a developmental psychologist, the potential for successfully adapting to the new job situation is almost entirely dependent upon substantial training. Little or no correspondence is expected between either the attribute requirements of the two jobs (content & methods) or between their conditions of performance (context).

The time and costs associated with training or retraining for an occupational change can be prohibitive for both individuals and employers. Perhaps the value and importance of transferable skills and occupational adaptability are best illustrated in this light. To the extent that the skills and performance requirements of jobs are similar, and individuals perceive the similarities and are able to transfer their skills and knowledges effectively, training time and costs can be reduced and can reflect significant savings to individuals and employers.

Raymond Christal and Joe Ward (1966) have pointed out some of the same concerns for occupational adaptability and for the costs of training in the military. They noted that in the Air Force:

> Every man . . . has been assigned a specialty code number, indicating that he is primarily trained to perform jobs in that specialty. Enlisted personnel in the Air Force change jobs on an average of once every two years, and can be moved freely from any job to any other job having the same specialty number. When an airman changes jobs, a major cost to the Air Force is the amount of time required for him to reach the same level of proficiency in his new job as he had attained in the job from which he was transferred. If jobs within specialties are not homogenous, the Air Force pays in two ways. First it must continually support a large and expensive retraining program; and second, at any point in time, a large number of men will not have reached proficiency in their current assignment. . . . The Air Force could not possibly maintain separate training courses for every job. Nor could it move personnel to meet changing priorities unless jobs and individuals are clustered into a limited number of management categories. . . . It seems clear that jobs should be grouped into specialties in a manner which minimizes the overall cross-training time among jobs within specialties (p. 11.02)[4]

Similar concerns appeared to underly a series of investigations of the "substitution potentials" in the skilled occupations reported by Hans Hofbauer and Paul König (1972). With reference to the system of occupational training in West Germany, Hofbauer and König pointed out that:

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[4] Christal and Ward, and a number of their colleagues at the Personnel Research Laboratory at Lackland Air Force Base, Texas, have developed and described an elaborate computer-based model, called the MAXOF Clustering Model (*Maximizing an Objective Function*), to accomplish the clustering of jobs to minimize cross-training time (see, for example, Bottenberg & Christal, 1961; Archer, 1966; Ward, 1961).

> Criticism of the present system of training relates primarily to the fact that the number of officially recognized skilled occupations (requiring either a phase of preliminary theoretical instruction or on-the-job practical instruction) is still much too great, despite a considerable number of deletions. . . . It is said that occupational training is, as a result of this, rendered too specialized and that the occupational mobility of gainfully employed persons is compromised . . . so-called occupational areas are to be formed, in which the most important aspects of the training for several related skilled occupations are grouped together . . . training should thus impart knowledge and skills which are requisite for different, but related, occupations (p. 4).

The investigators hypothesized that, "individual categories of training for the skilled occupations are polyvalent with respect to alternative positions of employment; that is, that persons with a particular background of training can meet the requirements of varied positions of employment" (p. 2). Moreover, the polyvalence of training backgrounds can be due primarily to a high degree of similarity in the occupational functions involved, or to the "coincidence of many of the substantive skills afforded by different courses of training" (p. 3). Hofbauer and König further noted that:

> It is possible . . . for various paths of training to have in common whole "molecules" of substantive skills afforded by way of such training. In this case the polyvalence of the training backgrounds is related more closely to the partial overlap of the substantive skills afforded by the training (p. 3).

Hofbauer and König found that, for nearly half (45.1%) of the posts held by gainfully employed males that require some training, supervisors said that "training in another occupation would suffice in lieu of [training in] the primary skilled occupational category" (p. 9). The areas where the greatest "substitutive interrelationships" existed were occupations within each of the fields of construction, metalworking and electrical technology, and the commercial occupations. However, such skilled trades as roofer, painter, tailor, interior decorator, baker, and butcher had a low proportional share of alternative designations of skilled occupations. Moreover, the investigators rejected the thesis that "the polyvalent nature of jobs can be traced exclusively to the phenomenon of specialization of the respective occupational functions" (p. 14). Some of the polyvalence among jobs seems to be due to transferable skills.

In both of these settings substantial effort and resources are targeted toward reducing the time and costs of training and cross-training. They point out the potential value and importance of transferable skills and transfer process skills for individuals and employers.

Fine (1957a) puts the concern for skills and abilities for job transfer into context when he reminds us that:

> Although similar skills and knowledges can be identified among jobs, the accuracy or utility of this identification depends on the degree to which the skills and knowledges are specifically defined, and determination by controlled study whether such similarities will aid or hinder transfer. . . . Knowledge of so-called transfer possibilities . . . is not by itself a crucial factor in placement activity. Much more fundamental limitations exist. With workers, . . . career framework considerations appear to be equally important. With employers, such factors as the monetary condition of the labor market and the character of the job specifications by which they hire

> are crucial. . . . Quite apart from the decisions of individual workers or employers, institutional factors exist, such as union controls, which place restrictions on transfer (p. 810).

In short, skills alone do *not* determine one's adaptability, or for that matter, one's occupational mobility. There appear to be a variety of other factors involved, such as, for example, union controls, personal career considerations, and conditions of the labor market, and we do *not* know a great deal about their relative importance or influence.[5]

In the absence of any hard evidence to the contrary, it seems reasonable to assume that skills, attitudes, and knowledge, are indeed among the important factors in adaptability. Moreover, while schools do *not* appear to be able to do a great deal about many of the other types of factors that might be important to job changing and adaptability, they can have a significant influence on the development of skills, attitudes, and knowledge.

Nevertheless, we are faced with a major dilemma. In general, the best situations for the study and understanding of adaptability, and those where the transfer of skills and characteristics are most likely to be important, appear to be those that require major shifts in employment and major changes in occupational performance. Unfortunately, these situations are the kind in which other factors, such as those noted above, also are likely to be important, and their influence confounds and complicates the effects and importance of skills and personal characteristics.

However, in the project's exploratory study of the usefulness of task classifications for identifying transferable skills, William Ashley and Harry Ammerman (1977) noted that:

> The transfer of a skill can be experienced when an existing skill must be used in a context or situation different from that in which it was originally developed or used . . . (transfer is evidenced when) new tasks are learned with less time or effort than possible without the previous learned ability (p. 10).

They pointed out, that while transfer can occur when a worker changes from one occupation to quite a different occupation, "an equally important occasion for skill transfer occurs when an existing skill must be applied in the same job but under different circumstances then previously required" (p. 10). Moreover, Wiant (1977) noted substantial consensus among employers that content-specific skills seem to transfer more easily in moves from assignment to assignment within an occupation than in moves between occupations (p. 12).

A series of studies reported by Jerome Moss and several of his colleagues described an interesting alternative way of examining transferable skills and adaptability within a single job, thus avoiding many of the confounding factors usually associated with a major change of employment. In their studies to develop an empirical procedure to map the technical conceptual domains and structures of workers Moss, Pucel, Smith, and Pratzner (1970) were able to distinguish between what they called "flexible" and "inflexible" workers. Flexible TV and radio communications repairmen were those who satisfactorily performed a greater variety of TV and radio repair tasks than inflexible workers.

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[5] Whether, in fact, one chooses to enter a job, or becomes employed in a job where the likelihood of success is good, obviously depends upon a number of other conditions. For example, the perceived correspondence between the individual's needs and interests and the reinforcers available in the particular work environment will likely be important considerations. Also important are the need and the opportunity to get the job, the job location, and the requirements for credentials.

If a wide variety of different kinds of service calls had to be assigned to technicians during the course of a work day, flexible workers were those chosen by their supervisors for the most novel, unusual, or complex assignments. Inflexible workers were those least likely to be chosen for those types of assignments (p. 75).

Significant differences in the technical conceptual domains and structures were found between flexible and inflexible workers. These differences may provide clues and help to explain the flexible (i.e., adaptable) worker's apparent facility and success in effectively transferring and applying technical knowledge to a variety of novel and complex repair tasks.

Adaptability and Vocational Education

The project's overriding interest and concern for occupational adaptability and skill transfer were their implications for relevant and effective education. Current problems and controversy over students leaving school without adequate command of basic skills in expression, comprehension, and arithmetic, and the finding, that by some estimations, over 1/5 of the nation's population is *functionally illiterate*, or functioning with difficulty, and is unable to cope effectively with daily life (Northcutt, 1975, p. 12), should lead to extreme caution in the assumptions made about the nature and development of transferable skills. It would be unsafe, for instance, to take for granted that because some skills are common to or widely applicable in a range of different, everyday situations, they are also easy to develop or to apply in new contexts.

Over 50 years ago, Bonser and Mossman (1924) observed that:

> . . . most school subjects had their origin in practical needs. However, the practical activities of daily life are not broken up into arithmetic, geography, history, and other divisions of materials as organized into school subjects. . . . Unfortunately, the individual facts and processes of these respective aspects of life have been so brought together to make subjects of study that they have become separated from the situations in which they are needed and for which they are of use. . . . Their separation from life has become so nearly complete that children have failed to see that in-school experience and out of school experience have any connection or relationship. It is very largely because of this want of connection that school experience has made so little desirable difference in the behavior of pupils outside of school and in after life (p. 67-68).

While progress may have been made, Sidney Marland's now famous address on career education to the National Association of Secondary School Principals in 1971 reiterates many of the same concerns and cautions expressed nearly 50 years earlier by Bonser and Mossman.

Calvin Taylor (1973) has noted that:

> The great breadth and complexity of mindpower potentials revealed by research suggests that schools at all levels are much too narrow intellectually. . . . Talent research findings now cry out loudly . . . that too many school activities are not relevant and too many relevant activities are not occurring in schools. . . . Teaching for multiple talents, therefore, offers the best hope of systematically reaching each and every student in our classroom. . . . (p. 100-101)

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In his remarks at the dedication of The Center for Vocational Education, Hugh Calkins (1969b) then Chairman of the National Advisory Council on Vocational Education, observed that:

> Most of those who fail to learn to figure, read, and write in our schools, fail because schooling seems to them an exercise in futility. Books which are irrelevant to their interests, classes which are oriented towards further years of schooling after the twelfth grade, mathematics which seems to serve no useful purpose, do not get the attention of boys and girls brought up to solve immediate problems . . . the connections between reading and employment, arithmetic and income, writing and self-respect, must be made clear. To the public, these connections are obvious. The public expects that schools will make them obvious to the students also (p. 4).

In tracing the evolution of the concept of equality of educational opportunity, James Coleman (1968) found that a critical and as yet unsolved dilemma in the secondary school curriculum grows out of the implicit assumption that a child's expected future is given:

> . . . the dilemma is directly due to the social structure itself: if there were a virtual absence of social mobility with everyone occupying a fixed estate in life, then such curricula that take the future as given (e.g., college preparation or occupational curricula) would provide equality of opportunity relative to that structure. It is only because of the high degree of occupational mobility between generations—that is, the greater degree of equality of *occupational* opportunity—that the dilemma arises (p. 14).

Reflecting the concern of one of the earliest of the National Advisory Councils for Vocational Education, Hugh Calkins (1969a) pointed out that, "the rapidity with which Americans will change jobs in their lifetimes must be matched by the variety and accessibility of training programs through which new skills and subject matter can be learned at any age in every locality" (p. 3). Commenting further on the nature of what seemed to be required, Calkins (1969b) noted that:

> The public does not expect that the school will train all students in all skills to levels of employability which will require no further training from employers. . . . What the public expects is basic training for employment for all students. Young people who do not go on to four year colleges need basic skills . . . many industrial employers, as a matter of fact, are much more interested in basic skills and attitudes of prospective employees, than they are in the specific ability to run their particular machine. The notion that schools "cheat" students by giving them partial preparation for industrial employment is a myth that does not correspond to reality (p. 3-4).

More recently, the COVERD committee (*C*ommittee *o*n *V*ocational *E*ducation *R*esearch and *D*evelopment) of the National Academy of Sciences has completed its assessment of vocational edu-education research and development. Discussing the changing focus of vocational education, the COVERD committee (1976) noted that:

> Because individuals can expect to shift occupations several times during their working lives, it is important to design vocational curricula that provide a useful basis for occupational versatility . . . vocational education programs should teach multiple and generalizable skills that will prepare people better for mid-career changes. The objective of training students for occupational versatility has not been easy to meet. Vocational education R & D has not successfully solved the

> problem of training people for the specialized technical skills required by certain occupations and, simultaneously, preparing them for a broader range of job opportunities (p. 99 and 11).

One example of how vocational education has attempted to solve the problem is the so-called cluster curriculum. On the other hand, an example of its failure to solve the problem might be the continued and almost exclusive reliance on job placement in an occupation related to training as the criterion for program success.

Cluster Curricula. In short, the cluster approach to curriculum and instruction essentially attempts to identify requirements or characteristics common to a group of related occupations. Learning then is to be focused on these shared requirements.

Cluster curricula, especially those that attempt to use some estimate of similarity in skill and ability requirements of jobs, would have much to recommend them. The concept of clustering continues to be of value, and has a variety of uses in career guidance, orientation, and exploration.

However, clustering does *not* seem to have found widespread acceptance or use for actual vocational preparation. Even where clusters have been used in manpower programs of the U.S. Department of Labor, their use has been primarily for objectives like occupational exploration (see, for example, Donovan, 1976). While there seems to be a considerable amount of continuing interest in cluster approaches to curriculum, and a fair amount of information describing alternative types and rationales for clustering, there seems to be a dirth of information or empirical data (e.g., follow-up studies of graduates) to verify the effectiveness of the approach.

There are as many different approaches or bases for clustering occupations as there are different ways of describing jobs. Thus, occupational clusters have been developed based upon similarity in such areas as equipment, materials, processes, location, skill requirements, and worker traits such as temperaments, general educational development, aptitudes and physical demands, or combinations of any of these characteristics.

There have also been attempts to develop occupational clusters or classifications using curriculum areas as the basis for clustering. McKinlay (1976) aptly pointed out, however, that the desire to relate occupations and curriculum areas can easily lead to confusion of the dependent and independent variables:

> Whereas the intent of vocational curriculum is to relate education to the labor market, curriculum area classification systems propose to classify occupations in terms of the established areas of curriculum specialization. This approach makes the Procrustian error of attempting to fit the labor market to the existing educational structure. Thus, such a system contains the inherent danger of failing to describe the labor market so much as the institutional arrangement of schools (p. 29).

Finally, there seems to be a significant difference between the cluster approach and the project's concern for occupational adaptability and transferable skills. Clustering approaches almost always begin with a concern for or focus on something outside of the persons; that is, with jobs or one or more features of jobs, or with school subject matter. The problem is that clustering principles use work factors that do *not* have analogs to human attributes. The concern for occupational adaptability and transferable skills begins, instead, with a primary concern for and focus on the individual. It is premised on the assumption that skills reside within and are capacities of people rather than jobs, and on the belief that it is the responsibility of all of education, *not* just vocational education,

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to help each student develop his or her capabilities to the fullest extent possible, consistent with their aspirations and goals. These human attributes also can be used to describe job requirements.

Job placement and relatedness of training. The previous discussion of the cluster approach points out one of the key problems in relying exclusively on "placement in a related occupation" as the criterion for estimating a vocational program's success or effectiveness. There are many ways, little agreement, and substantial difficulties involved in trying to determine which occupations are related to training and how they are related (see for example, Wheeler, 1971).

Rupert Evans (1968) has provided an interesting and insightful example of some the problems inherent in the job placement criterion. He noted that:

> There is an interesting conflict between our desire to prepare our students for a wide range of employment, and our principal evaluative measure—"proportion of students employed within three months in the occupation for which trained." A school will get highest short-term placement records with a program which:
>
> a) prepares for employment in a particular establishment;
>
> b) concentrates on a particular set of skills needed for employment at that moment in time;
>
> c) carefully shields the student from a view of occupations other than the one for which he is being prepared;
>
> d) emphasizes only the desirable aspects of employment in that occupation;
>
> e) carefully rejects all students who would not be enthusiastically received by employers and labor organizations;
>
> f) encourages students not to enter higher education;
>
> g) encourages the student to continue in the field originally chosen, even if he finds later he is not capable or interested in it.
>
> Such a program would be extremely narrow and would be rejected immediately by any high school vocational teacher. Yet this is the program which should be followed to get high initial placement rates (p. 199).

Project involvement with the concepts of transferable skills and occupational adaptability, as well as the fact that occupational change is a frequent and pervasive fact of life in this country, lead to the suggestion that we urgently need to reassess the almost exclusive reliance on training-related placement as the criterion for program effectiveness. Otherwise, those vocational programs that also effectively develop transferable skills and characteristics will be penalized, along with ineffective programs, if their graduates eventually find employment and succeed in a range of occupations seemingly unrelated to the course title.

Job placement in an occupation related to training should be one of several alternative measures of program and student success. It is useful when measured soon after graduation as a means of determining societal impact or satisfaction. In other words, if society needs plumbers, are training programs developing them? Nevertheless the issue of job-relatedness should be reexamined in the light of the notions of occupational adaptability and transferable skills. For instance, it could be argued that one appropriate success criterion for programs deliberately aimed at development of occupational adaptability and transferable skills might be initial placement in and adaptability of graduates to the widest possible variety of seemingly related and unrelated occupations. The merits and feasibility of such a suggestion should be examined critically. Also, at one of the meetings of the project's Panel of Consultants, Calvin Taylor suggested that we might begin to examine the feasibility and implications of such ideas as for example, giving "incomplete" grades to all students at the end of courses or programs until the intended application and transfer of skills and knowledge has occurred outside the classroom and can be demonstrated.

Skills, Knowledge, and Attitudes

Identifying transferable skills is complicated by several problems. Two of these are: (a) lack of a common or single definition for such basic concepts as skills, attitudes, and knowledge, and (b) inadequate knowledge and understanding of the process of transfer and the factors that inhibit or facilitate the use or application of skills and personal characteristics in different settings.

This section will examine briefly some definitional concerns. A later section will take up the matter of the transfer of skills.

The definition of *skill* is a thorny problem because of the different meanings it has for different people in different contexts. In their reviews of literature and research for the project, both Altman (1976) and Sjogren (1977) have identified several definitions of skill and each author has discussed a number of related definitional issues.

Three definitions of skill are briefly discussed here—skill defined as: (a) a learned behavior, (b) an underlying component of behavior, and (c) the level or degree of proficiency of behavior. These definitions appear to have two things in common. First, each refers to human behavior. Second, each directly or implicitedly refers to behavior that is learned. In addition to these questions of definition, some related questions recurring in conversation about transferable skills are discussed briefly.

Learned Behavior

One of the most common definitions is that a skill is a learned behavior. When a particular set of conditions has elicited a certain behavior and the behavior has been reinforced sufficiently, it is expected to occur again under identical or similar conditions. When it does, we conclude that learning has taken place, and that an individual has acquired or learned a particular behavior or a skill. By this definition, skill is equated with behavior and any learned behavior is a skill.[6]

Also by this definition, knowledge and attitudes may be viewed as different kinds or sets of behaviors; that is, as psychomotor, cognitive, and affective behaviors. Thus, hammer nails (predominantly psychomotor behavior), add whole numbers (predominantly cognitive behavior), and act responsibly (predominantly affective behavior) are examples of different types or kinds of behaviors and skills. Obviously, most behaviors are *not* pure examples of any of these three types. Instead, most behaviors are made up of combinations of tasks that require psychomotor, cognitive, and affective behaviors.

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[6] Excluded as skills by this definition—in fact, by all three definitions—are unconditioned reflexes or unlearned behaviors such as blinking one's eyes in response to sudden movement, or jerking one's knee when it is relaxed and tapped sharply in the right place.

Underlying Components of Behavior

Another definition is that a skill is an underlying component of behavior. By this definition, a skill is a human capacity or potential that resides within individuals. Thus, while skills are *not* directly observable, their existence is inferred from observation of behavior. In other words, the only way of knowing whether an individual has developed a certain capacity or potential—or has acquired or learned a certain skill—is by inference through observation of behavior. The more often a particular behavior occurs, the more assurance there can be that certain skills have been acquired. Thus, if one has been observed over time doing such things as, for example, correctly balancing a checkbook and making correct change, we would infer the acquisition of such underlying arithmetic skills as addition and subtraction.

By this definition, knowledge and attitudes, like skills, are hypothetical constructs describing types or kinds of human attributes. They are underlying components of behavior whose existence is inferred from behavior. Thus, the acquisition or development of such human attributes as *honesty* and *integrity* can be inferred from observations of such behavior as the refusal to lie, steal, or be deceiving.

Level or Degree of Proficiency in Performance

By either of the previous definitions, skills are defined dichotomously. Either one has or does *not* have a particular skill—either one can measure distances with a graduated ruler or one cannot.

In contrast, if a skill is defined as the level or degree of proficiency of behavior, then "measure distances with a graduated ruler" is *not* necessarily an example of a skill. It is simply an example of a learned behavior.

By this definition, a skill is a characteristic or a feature of behavior performed at an acceptable level or degree of proficiency (e.g., the level or degree of accuracy of taking a measurement). The level or degree of proficiency of behavior can be variable or fixed. Thus, for example, "measure distances accurately to the lowest division of a graduated ruler" and "type quickly and accurately on an electric typewriter," both describe a variable degree of proficiency, while "measure distances accurately to within plus or minus 1/64 of an inch," and "type 50 words per minute without errors," describe fixed degrees of proficiency.

By this definition also, knowledge and attitudes are viewed as underlying components of behavior. However, the mere acquisition or development of certain knowledge or attitudes—cognitive or affective behaviors—does *not* constitute skill. Rather, the level or degree of proficiency of behavior is the basis for defining skill. Thus, for example, "getting along with others" could be an affective skill if it were done *well;* that is, it met a specified level of acceptable proficiency.

In the case of cognitive and affective behaviors, skill seems to be defined most often as a variable level or degree of proficiency. Also, proficiency is often interpreted or defined in a number of different ways and is somewhat dependent upon the nature of the behavior.

Regardless of the definition of skill, it is convenient to distinguish knowledge and attitudes from skills as either (a) different kinds of human attributes, (b) special types of skills, or (c) underlying components of behaviors or skills. Moreover, regardless of how they are defined or distinguished, it seems apparent that the acquisition or development of knowledge and attitudes can only be determined through inference based upon observations of performance. Throughout this report the phrase skills and personal characteristics (or just characteristics) has been used to refer to individual attributes transferable to or useful in a range of settings. Included among these personal characteristics are knowledge, attitudes, temperaments, and personal habits.

General vs. Specific Skills

Implicit in much of the thought and dialog about skills, and in particular, transferable skills, are the often subtle and widespread assumptions that: (a) skills can be dichotomized somehow into general skills and specific skills, and that (b) generally applicable, multiple-use (i.e., transferable) skills are synonymous with general skills. These assumptions seem to be incorrect, or at the very least misleading, and have contributed to serious misunderstandings.

All skills are specific skills. The distinction between skill specificity and generality is correct if it refers to the range or span of skill applicability. That is, general skills may be correctly thought of us multiple-use skills, while specific skills have a more limited or narrow range of application. It is incorrect if it is intended as a reference to some inherent quality in the nature of a skill.

A traditional debate in education programs with occupational emphasis or orientation concerns the matter of whether these programs should focus on development of specific technical skills or on more generally applicable occupational skills. This argument is often confounded by the erroneous distinction between general and specific skills. In fact, the distinction between general and specific should be applied to training programs and *not* to the skills to be learned.

In his discussion of what he called "firm-specific" skills and knowledges, Rupert Evans (1971) noted that economist Gary Becker (1964) provided a useful way of thinking about and describing the specificity and applicability of skills:

> [Becker] identifies a range of training from the very specific, that has no effect on the productivity of trainees that would be useful in other firms, to the very general, which increases productivity by the same amount in all firms. . . . Training in typing, which would be considered quite specific by most educators, would be regarded as "general" since typing skills are useful in many firms. . . . If an employee had only skills and knowledges which were firm-specific, his mobility outside that firm (and perhaps even within the firm) would be quite low, for he would not have skills which are saleable [i.e., transferable] on a broad market. . . . As firm-specificity increases, the possibility decreases that workers who have the needed skills will be available. . . . Firm-specific skills and knowledges should seldom be taught outside the firm in which they will be used (p. 117).

Value of Skills

Value does *not* seem to be inherent in a skill. Differential importance and value are attributed to different skills, knowledge, and attitudes by the range of socially approved and valued contexts within which people must function. Skills essential for effective and safe performance within a specific context usually are more important and can be distinguished from "nice-to-have" but unessential skills within that context.

Obviously, skills, knowledge, or attitudes essential in one context may turn out to be nonessential, or even undesirable and dysfunctional, in another context. Thus, for example, initiative may be an important and valuable attribute for effective performance in a wide range of settings including such contexts as voluntary community action work, or in the maintenance and upkeep of a home, but may *not* be necessary or valued in the context of assembly-line production jobs. On the other hand, the project meetings with employer representatives identified considerable agreement on the perceived value of certain skills noting that, "perhaps more workers lose jobs due to the lack of positive attitudes and interpersonal skills than to the absence of other, more job-specific skills" (Wiant, 1977, p. 12).

Some Examples of Transferable Skills and Characteristics

The project began with questions about occupational change and the importance of skills and abilities in this process. The discussions quickly turned to three kinds or sets of skills that seemed to be related to job change: (a) job-changing or job getting skills, (b) transfer skills, and (c) transferable skills and characteristics. Each of these three kinds of skills appear to be especially important for different purposes in a person's career. Their acquisition is related to and necessitated in large part by the expectation that individual mobility will continue throughout one's working life.

Job-changing or job-getting skills, such as job seeking skills, interviewing skills, and skills in resume preparation and in filling out job applications, are important in seeking and getting a job. In this context, they do *not* have a role in the performance of the job, but they are vitally important to the experience of job change, and they are considered to be transferable skills in this discussion.

Transfer skills are different from what are referred to here as transferable skills. As used in the psychological literature (Altman, 1970, 1976), transfer skills usually refer to skills and abilities needed in order to generalize learning, or skills used to detect and to make appropriate applications of prior learning in new settings or under different circumstances (e.g., stimulus and response generalization, perceptual and discrimination skills).

Transferable skills and characteristics are generally applicable, multiple-use skills, knowledge, attitudes, and personal characteristics. While it appears that *all* skills and personal characteristics are potentially transferable to some extent and on some occasions, transferable skills are most often generally thought of as skills and characteristics useful or applicable in a wide range of settings or different circumstances. The transferability or application of skills and personal characteristics seems to be situationally defined, and dependent upon the correspondence between their level of development and the level of development required for performance in different situations, and on the extent of prior application in diverse situations. With regard to work, Robert Stump (1976) has described transferable skills as "the skills and abilities which an individual brings with him/her from job to job, and which apply in each job" (p. 15).

Of these three, the project has focused primarily on transferable skills and characteristics. Schools seem to have made progress in providing for development of job-changing skills. Among other things, many of these kinds of skills are taught directly. Resources that make better use of current labor market information are being developed for use in improved career awareness and guidance programs. Progress is also evidenced by the greater involvement and responsibility that schools are assuming for job placement, counseling, and follow-through activities, and by such developments as student competency transcripts and cooperative work experience programs in business and industry. However, in contrast to job-changing skills, provision for the development of occupational flexibility and skills that are transferable appears to be largely an unmet and important need (Miguel, 1977) with significant implications for what and how education is provided in the future.

The project also chose *not* to focus on many of the questions about transfer skills raised largely by Altman. The questions were fully developed only after many project activities were underway and seemed to lead in directions that were far removed from the the application to specific jobs and occupational change. Their importance was recognized and perhaps future research effort should be devoted to explorations of transfer skills in real (i.e., non-laboratory) settings.

When the search began for the ways that researchers and others in business and education identified the transferable skills the project decided to focus on, it found that the more general the applicability of skills, knowledge, and attitudes, the more they appear to be the common, everyday capabilities sought by all. In fact, it was concluded that common perceptions about their ordinary nature were barriers to their adequate identification and deliberate development. Either they were presumed to be learned or they were too complex to teach.

To date there does *not* appear to be a single agreed upon list of skills and personal characteristics generally applicable across a broad range of settings. Instead, there are many such lists. Examples of the kinds of lists that were identified by the project include: a list of occupational survival skills (O'Neil, 1975), a list of generic skills (Kawula & Smith, 1975), two lists of human attribute requirements of jobs (Neeb, Cunningham, & Pass, 1971; and Mecham & McCormick, 1969), and a list of transferable skills and personal characteristics identified by local business and community representatives in a series of meetings conducted by the project (Wiant, 1977). Each of these five lists has been included in the Appendix of the report for the reader's quick reference.

Douglas Sjogren (1977) reviewed for the project a wide range of literature and research related to transferable skills and characteristics, including the work that resulted in several of the lists noted above. Using the 5-category skill classification scheme of the Generic Skills Project, Sjogren summarized as follows his conclusion to the question of which skills are highly transferable.

1. *Mathematics skills.* In the area of mathematics, the evidence seems to be that skills through what is usually regarded as first year algebra are transferable across many occupational situations. Skills at a higher order are certainly transferable but to a much more restricted range of occupations.

2. *Communication skills.* To have some reasonable range of occupational options, a person should have skills in verbal and nonverbal forms of communications, written expressions and comprehension, and speaking and listening. The level of development of these skills seems to be about what might be expected of a student in the secondary schools.

3. *Interpersonal skills.* There seems to be considerable overlap between this area and the communication skills area. Generally it would appear that a person should be able to carry on a conversation, give intelligible instructions to others, and generally be able to attend to others in a positive manner. The importance of interpersonal skills to worker success has been recognized increasingly in recent years, to the extent that many organizations provide extensive educational programs in this area. This is an area, however, that has received little emphasis

> in the regular educational programs. Thus, it is difficult to say at what level of proficiency high school graduates could be expected to have developed interpersonal skills.
>
> 4. *Reasoning skills.* Estimation and information-seeking skills are important in this area and are given some emphasis in the schools. Other skills like setting priorities, determining alternatives, and planning are probably *not* emphasized as much. These skills do seem important, however, for a large number of occupations. Perhaps the current educational/training system does less in this area than in others.
>
> 5. *Manipulative skills.* In the psychomotor/sensory area the skills apparently transferable to a large number of occupations seem to be those of sensory acuity, manual dexterity, and coordination. Some of these skills may be more genetically determined than those in the other areas. Skills in this area are amenable to training, however, and this is another area in which our current educational and training programs may be somewhat deficient (p. 22).

In addition to the literature reviewed by Sjogren, a number of other reports have suggested alternative approaches and additional examples of skills. Norvell Northcutt, director of the Adult Performance Level Study (1975), sponsored by the U.S. Office of Education, pointed out that most people learn how to cope with daily life through experience that can cost a lot both emotionally and physically. He suggested that experience, or *functional competency*—the ability to apply skills in everyday life—can and should be taught at all levels of education to better prepare people for coping with life. He identified five general knowledge areas to describe the content of literacy: "(1) consumer economics, (2) occupational (or occupational related) knowledge, (3) community resources, (4) health, and (5) government and law." The project noted four primary skills that seemed to be involved in literacy and to account for the vast majority of requirements placed on adults: "(1) communication skills (reading, writing, speaking, listening), (2) computation skills, (3) problem solving skills, and (4) interpersonal relations skills" (p. 2).

These knowledge and skill components appear to be analogous to or are a significant part of what the project has called transferable skills useful in a wide range of jobs and other everyday life situations. The Adult Performance Level project suggests two practical recommendations. First, special attention and effort should be directed at the identification, description, and teaching of those often-ignored skills and knowledges acquired by many through costly life experiences. Second, ways need to be devised so that people can receive appropriate credit or recognition for functional competencies, regardless [illegible] when or how they are acquired.

A study conducted at the American Telephone and Telegraph Company (Short, Dotts, Short, & Bradley, 1974) identified the following examples of job tasks, as well as skills, that seem to be part of a broader range of occupations than those they studied:

- Legible handwriting on contact memos
- Accurate, fast arithmetic calculations
- Spelling of common nouns

- Familiarity with job names in business, industry, and government
- Ability to understand and interpret information presented by phone alone
- Ability to communicate an attitude of interest and helpfulness [or other attitudes] by voice alone
- Ability to simultaneously perform several tasks (e.g., listening, writing, working mathematic problems)
- Ability to get accurate information from compact reference sources such as tables, charts, and graphs
- Flexibility in changing work strategies under different supervisory and reward conditions
- Apply rules to the classification of new examples
- Apply multiple procedural rules in a classification task
- Listening and talking to people
- Constructing learning aids and job aids to guide learning and job performance (p. 20-21).

Calvin Taylor (1973) has pointed out that 98 talents, human attributes, or inner process skills have been identified and measured. He suggests a grouping of talents based upon world-of-work needs. Besides academic talent, he emphasizes five other extremely important types or broad groups of talents:

- Creative (and productive) talent
- Evaluative or decision-making talent
- Planning talent
- Forecasting talent
- Communication talent (p. 68).

Taylor also pointed out that schools have focused almost exclusively on the development of academic talents and have tended to ignore development of other types of talents. Because each type of talent is important, and research to date has shown that performance in one talent area is essentially independent of performance in any other area, he feels that students and schools must make more deliberate efforts to emphasize and develop abilities in each of these distinct areas of talent.

While it is relatively easy to find or generate lists of skills such as those cited in the examples above, there do *not* appear to be objective or non-arbitrary criteria to decide whether one list is better or more valid than another. The composition of such lists of widely applicable skills would change with the use of different schemes for classifying jobs. For instance, skills such as minimum proficiency in the use of common hand tools, might be included in a list of widely applicable skills of so-called "blue collar" jobs, or jobs classified as dealing primarily with "things," but they are far less likely to be the skills generally applicable to "white collar" jobs or to jobs dealing primarily with "people" or "data" (Ashley & Ammerman, 1977).

Another limitation of such skill or attribute lists is that all of the items seem to be of equal importance, and all the skills or attributes somehow seem to get reduced to a single level of specificity. The lists do *not* reflect adequately, if at all, the interrelationships, specificity, richness, and complexity of some skills and combinations of skills. It is very difficult to cross-reference items in several lists, or to combine or consolidate lists.

Two brief examples may help to explain and illustrate these points. Consider the apparent differences among the items below which could represent skills or knowledge in three different lists, or even more problematically, could be included separately in the same list. Do they represent different levels of specificity for essentially the same knowledge and skill(s)? Or, do they represent different skills and knowledge?[7]

- Social skills needed in work

- Getting along with others

Knowing—

- That acceptance by the work group is highly desirable
- What constitutes a good day's work
- Which persons have views acceptable to the group; which do not
- Which persons must be listened to politely, but then ignored
- Which persons must be pointedly ignored
- Which persons can be spoken to frankly
- Which persons must be misled

The problem of lost and confused meaning inherent in lists of short words or phrases can be illustrated by a quotation from Sir Frederic Bartlett in which he described what one of these lists might mean by "problem solving" skills.

> The problem of transfer may be one of training individual judgment to determine whether many different jobs may not actually be approached by identical methods. . . . We should set the learner from a very early stage on the way to realize that the number of ways of doing things is very far short of the number of things that have to be done, and that the methods, procedures, and plans of attack remain much the same in circumstances and for problems which at first sight appear very different from one another (Fine, 1957a, p. 809-810).

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[7] Incidentally, Bruce McKinlay (1976) noted that, despite great strides being made to teach such kinds of social skills, the so-called "teachable content" of jobs usually turns out to be the technical skills, while the social skills that are sometimes more important are omitted from consideration (p. 30). Rupert Evans (1971), from whom most of the examples in the chart above were drawn, also pointed out that most vocational course content concentrates almost exclusively on technical skills. Educators often overlook or pay little attention to the social skills and knowledge that are common throughout an occupational field and can be learned in advance of entering employment (p. 141).

How much of the richness and meaning of his point would come through if it were reduced to the two words "problem solving" in a list?

Aside from its use to illustrate a perceived shortcoming of skill lists, Bartlett's statement has importance for education and training. In light of the familiar problem that skills taught in school often are *not* applied effectively outside of the learning setting (e.g., doing arithmetic in school vs. applying arithmetic on a job), it suggests that application and practice of a skill under a variety of realistic life and work performance conditions should facilitate subsequent application or transfer to a wider range of settings outside of the school.

The project has come to several tentative conclusions about how skills and abilities should be thought of in order to be aware of and to develop them in ways that enhance their transfer.

1. Skills are *not* the same as behavior. The presence or acquisition of skills is inferred from the observation of behavior.
2. Knowledge and attitudes are also inferred from observed behavior and, in combination with skills, result in behavior.
3. Skills, knowledge, and attitudes are all learned, and are potentially transferable.
4. The specificity and generality of knowledge, skills, and attitudes in the discussion of transferability are *not* qualities inherent in the knowledge, skills, and attitudes. Rather, specificity and generality are inferred from the range of situations in which they can be applied to produce effective behavior.
5. It has been relatively easy to identify lists of skills, knowledge, and attitudes that are broadly applicable and transferable, but such lists are less than perfect for a number of reasons.

Despite this state of less than perfect knowledge and total consensus, the project has come to some understandings about how these thoughts and ideas can be applied to the practice of education at all levels.

Some Practical Suggestions and Applications

Develop Human Potentials or Capacities for Performance

Earlier sections on the definitions of skills, knowledge, and attitudes, and the previous examples of transferable skills and characteristics, have attempted to illustrate the nature of transferable skills and the nature of potential content for learning. While these discussions may have implied that education can and should be knowledge-based or focused primarily on learning specified content and skills, this was *not* the intention. Rather, the intention was to suggest an alternative to knowledge-based schooling. The alternative is student-centered instruction focused on the development of individual performance potentials, capacities, or talent areas, rather than the acquisition of knowledge by students. Education that results only in knowledge acquisition would *not* be sufficient to enhance adaptability. The focus should be on helping each learner develop the full range of his or her talents, potentials, or inherent human attributes to levels that will enable them to perform effectively in a variety of settings. This section attempts briefly to describe and illustrate some of the key features of such an alternative approach.

It should be noted at the outset that the acquisition of knowledge, skills, and behaviors certainly is an important *outcome* and an important *means* toward the end of student-centered learning. Thus, it is *not* suggested that individual capacities or talents can somehow be singled-out or developed in the abstract or in the absence of a meaningful and important context. Such a notion is about as absurd as the idea that they are also used, applied, or required in isolated or abstracted forms without any reference to a meaningful end or to accomplishment of an important task. Rather, subject matter, knowledge and content should provide meaningful and relevant contexts as learning vehicles for the development of individual attributes.

However, schools cannot prepare students for all future contingencies. Not only is the future unknown, but what speculation there is about it suggests that it will change. Additionally, McKinlay (1976) pointed out that, "people are multitalented, occupations have flexible requirements, and the interaction is dynamic" (p. 49). Educators somehow need to decide which skills, knowledge, or behaviors are intended for learning, and what levels of proficiency are intended to be developed by students. Critical decisions must be made about what is important for learning, what is merely "nice-to-know," and what is nonessential. Moreover, decisions about what is learned also affect how learning takes place.

The findings of the project make the case that transferable skills and characteristics should be among the more important outcomes of student learning. These clearly go beyond the basic three R's generally posed as the essential task of education. Moreover, teaching for skill transfer and application seems to be an effective way of teaching the basics (Miguel, 1977). Also,

> education is supposed to provide the student with tasks which will have significant utility over some non-trivial period of time—and preferably throughout his remaining life . . . tasks for which education provides an opportunity to achieve performance capability should be basic in some sense. That is, they should have broad rather than narrow applicability in the student's life (Altman, 1970, p. 58).

Human potentials or attributes can be thought of and have been described in a number of different ways. For instance, Calvin Taylor (1977) has described them as "multiple intellectual talents," "inner processes," "mindpower," and "brain-power resources." He also has reminded us that a most important and repeatable finding in psychology is that people differ in any and every human characteristic considered, and that

> in examining several characteristics within the same person, the usual finding is that different characteristics do not exist to the same degree or in the same concentration or intensity within any individual (p. 1).

The list of basic human attributes by J. Pass & William Cunningham (1975), and the list by Ernest McCormick & Robert Mecham (1976), were both noted earlier and represent other ways of describing human potentials for performance. Shown on the next page is an abbreviated version of some of the attributes included in these two lists.[8] Many of these items are quite different from those noted by Taylor. Nevertheless, there appears to be some similarity between many of the cognitive abilities shown here and the broad types of intellectual talents described by Taylor, and both

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[8] Complete lists and definitions of the attributes identified in these two sources are included in the Appendix of this report.

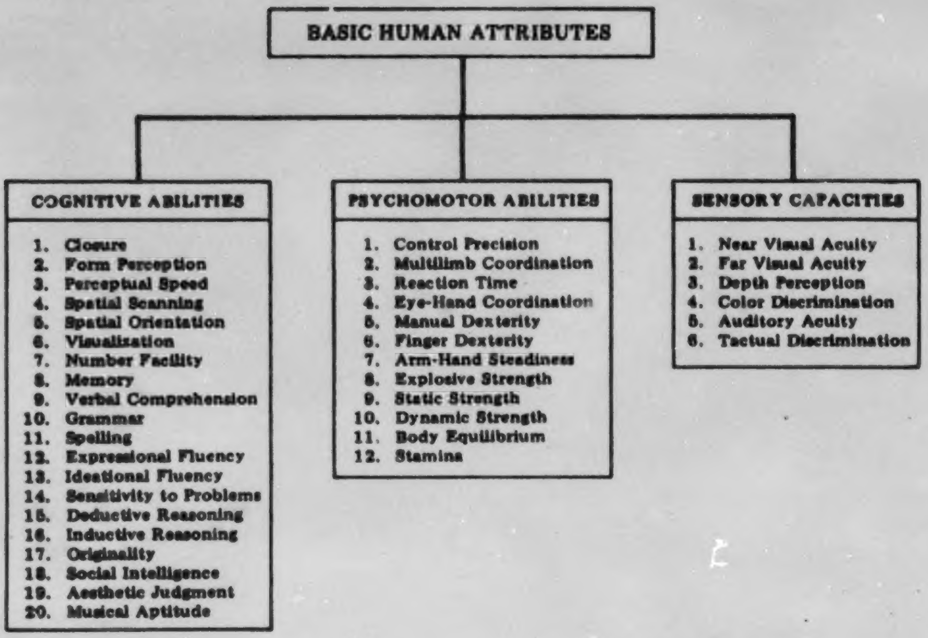
BASIC HUMAN ATTRIBUTES
COGNITIVE ABILITIES
1. Closure
2. Form Perception
3. Perceptual Speed
4. Spatial Scanning
5. Spatial Orientation
6. Visualization
7. Number Facility
8. Memory
9. Verbal Comprehension
10. Grammar
11. Spelling
12. Expressional Fluency
13. Ideational Fluency
14. Sensitivity to Problems
15. Deductive Reasoning
16. Inductive Reasoning
17. Originality
18. Social Intelligence
19. Aesthetic Judgment
20. Musical Aptitude
PSYCHOMOTOR ABILITIES
1. Control Precision
2. Multilimb Coordination
3. Reaction Time
4. Eye-Hand Coordination
5. Manual Dexterity
6. Finger Dexterity
7. Arm-Hand Steadiness
8. Explosive Strength
9. Static Strength
10. Dynamic Strength
11. Body Equilibrium
12. Stamina
SENSORY CAPACITIES
1. Near Visual Acuity
2. Far Visual Acuity
3. Depth Perception
4. Color Discrimination
5. Auditory Acuity
6. Tactual Discrimination

Figure 4. Examples of human attributes or capacities for performance.

represent basic human potentials, capacities, or talents (as opposed to task performance capabilities such as "work as a member of a team," "organize work activities of others," and "solve a problem").

Important for education and training are the assumptions that (a) these kinds of individual human potentials or capacities are the basic components of behaviors or skills and should, therefore, be the focus of development, and (b) the attributes are characteristics of people and are inherent in individuals.

While the number of attributes may be finite and can be identified and described, the number of combinations and formulations that make up complex skills and behaviors seems, for all practical purposes, to be infinite. Individual differences in performance and behavior are largely the result of different attributes or potentials being developed or of differences in the level or degrees of their development. Thus, for example, some potentials can be well developed while others can remain dormant, be underdeveloped, or be underutilized for long periods of time.

The kinds of attributes cited above are intended as examples of the kinds of individual talents or potentials that schools might reasonably be expected to emphasize. Taylor (1973) has asked, "shouldn't each student have the chance during school time to develop each of his multiple talents, since each different talent enables subject matter acquisition?" (p. 106). He pointed out that:

> Talents are the inner processes that can be used in working with and acquiring knowledge at least as fast, if not faster, when they utilize and develop new talents while acquiring the subject matter (p. 105). . . . A greater transfer of training (or

> spread effect) to later situations in life may occur through the talents developed than through the knowledge acquired. Nonetheless, Multiple Talent Teaching capitalizes on both to increase the total transfer of training into later situations (p. 106).

In distinguishing what he has called knowledge dispensing from teaching for talents, Taylor (1973) noted further that:

> The Teaching-of-Knowledge Approach has proved to be much less sound as an educational focus than expected . . . it rests upon the big but erroneous assumption that all good things will happen to all persons if and when they become sufficiently knowledgeable (p. 106). . . . A teacher can be a developer of talents as well as a subject matter dispenser. . . . In the student-centered approach, . . . teachers change their roles to be igniters of talents, catalyzing, cultivating, and developing a variety of world-of-work talents in students by using knowledge as their means to that end. In fact, the talent developer role could well be the primary one (p. 102).

Teach for Transfer

It seems apparent that some skills, knowledge, attitudes, and personal attributes are more transferable to or useful in a wider range of settings or situations than are others. Nevertheless, the project has concluded that *all* skills are potentially transferable to some extent and on some occasions. Thus, the process of transfer, and especially teaching for transfer, are of paramount importance for education.

Benjamin Bloom (1956) put the importance of the matter well when he wrote that:

> The fact that most of what we learn is intended for application to problem situations in real life is indicative of the importance of application objectives to the general school curriculum. The effectiveness of a large part of the school program is therefore dependent upon how well the students carry over into situations applications which the students never faced in the learning process. Those of you familiar with educational psychology will quickly recognize this as the age-old problem of transfer of training. . . . The general consensus seems to be that training will transfer to new areas most readily if the person is taught in such a way that he learns good methods of attacking problems [also recall Bartlett's point, p. 29], if he learns concepts and generalizations, rather than how to use certain facts in specific instances, if he learns proper attitudes toward work, and if he develops proper attitudes of self confidence and control. It is obvious that the objectives in the application category, as they embody the meaning of transfer of training, are extremely important aspects of the curriculum (p. 122-123).

The study of the transfer of training has received a great deal of attention over a long period of time, particularly among educational psychologists. Unfortunately, it is beyond the scope of this report to present a review of the relevant literature and research in this area. However, as a part of the work of the project, James Altman (1976) reviewed a substantial body of research related to the process of skill transfer. Some of his conclusions and their implications are cited here.

Lawrence Stolurow (1966a, 1966b) has completed a monumental study of the psychological and educational factors in transfer of training. Section 1 of his final report (1966a) is a compilation of 200 principles of transfer grouped into 15 major categories that were derived from a selected set of 1,700 titles or references. Stolurow points out that the statements, while in the form of principles, are in reality hypotheses, and that the list is not exhaustive. Also, in most cases, they reflect the predominant trends, in terms of findings from experimentation (p. 32). Section 2 of his final report (1966b) is the bibliography of more than 1,700 studies completed between 1890 and 1966 related to the transfer of training.

In the light of this substantial amount of attention and study, it is truly ironic that so little actually is known about the transfer of skills and knowledge and that very little guidance and few recommendations for practice can be offered with confidence. Stolurow (1966a) concluded that, despite more than 60 years of research on transfer, and the fact that information about transfer is critical for the efficient planning of lessons, courses, curricula, and educational media, "there is little definitive information or explicit guidance to offer either the course developer, the curriculum builder or the media specialist" (p. 1). Similarly, Altman (1976) concluded from his review that the state of organized reliable knowledge regarding the transferability of vocational skills is rudimentary at best (p. xi).

In spite of these limitations, Altman (1976) like Calvin Taylor has suggested that the optimization of skill acquisition has clear importance for educational design and practice because, among other things, skills *not* acquired obviously cannot be transferred (p. 42). He feels that "a generalized orientation toward competency is essential not only for adequate development of an individual's potential, but also for full positive transfer to and across jobs" (p. 43).

In a review of research related to the function and desirability of error making in the learning process, Robert Singer (1977) concluded that, "if the purpose of the learning situation is to lead to the application of what has been learned for transfer to other related skills and situations, it would seem that some form of discovery, problem-solving, or trial-and-error strategy should be employed" (p. 494). He noted that:

> Rules and strategies, if constructed correctly and usefully, should enable the learner to adapt what has once been learned to new but related circumstances. This type of transfer effect occurs when the individual has learned how to analyze tasks, to develop internalized guidelines for solutions that are not learned only by rote, and to formulate rules and strategies associated with the successful undertaking of a cluster of tasks, even though direct experience may only have been offered with one task in one situation (p. 493).

Singer has also pointed out one of the dominant themes throughout much of the literature on transfer. For activities that ultimately make varied and often unpredictable demands on the person, practice under a variety of conditions is important.

> Sufficient experience in an assortment of environments is in order. Practice may be guided at first to some degree for the learning of basic skills. But strategies and tactics need to be developed as well, to trouble-shoot, adapt, and adjust to the potential future demand characteristics of the situations in which the activity will be performed (p. 491).

In other words, their application and practice under a variety of realistic life and work performance conditions should facilitate subsequent application or transfer of skills, knowledge, and attitudes to a range of other life and work settings within and outside of school. In fact, an important justification and rationale for many typical extracurricular school activities is the range of different opportunities they can provide for applying and practicing knowledge, skills, attitudes, and behaviors learned in classroom settings. It is sad, but nonetheless true that, for many students, classroom activities often appear irrelevant and extracurricular-type activities offer them the only real opportunities to perceive and develop this critical awareness. Moreover, to optimize initial learning, as well as the subsequent transfer of learning, it seems essential that students explicitedly be made aware of the skills, knowledge, attitudes, and other attributes being developed and of their potential applicability or transferability to other situations.

Richard Miguel (1977) has reported many of the insights gained from the project's review of selected operating programs in schools and in businesses. Among his important findings was the observation that few, if any educators will deny the value of students becoming occupationally adaptable. Allen Wiant (1977) also reported positive perceptions and attitudes about adaptability and the transfer of skills among training directors, union representatives, and personnel managers in a variety of business and industrial settings. Nonetheless,

> Occupational adaptability or skill transfer is, at best, a serendipitous outcome of most educational programs. At the very worst, some programs force students into occupational "straight jackets" by missing every opportunity to show students the multiple applicability of the skills they are developing. . . . Very little attempt is made programmatically to develop these skills. Academic programs, in particular, often belittle the pragmatic concerns associated with work and many vocational programs are obsessed with skill preparation that is unnecessarily circumscribed (Miguel, 1977, p. 24).

The transfer or application of learning to situations outside of the original setting has been described as a four-step process:

1. Original learning of material and/or skill.
2. Recognizing the relevance of the original learning to a new situation.
3. Remembering the original material or skill.
4. Applying the original learning to a new situation; i.e., problem solving (Hermann, Richardson, & Woodburne, 1976).

Using this four-step process, the principles of transfer identified by Stolurow (1966a), and drawing on a variety of other research literature, Graham Hermann has attempted to highlight some practical suggestions and techniques that may help in teaching for transfer.[9]

1. *Original learning*

    - It would seem necessary to master and then overlearn the original content or skill if transfer is desired.

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[9] The following material was abstracted from personal correspondence with the author, September 1977.

- The learner can be provided with a variety of examples in initial learning to facilitate discrimination among sets of new conditions.

- The learner can be shown how to actively analyze new situations to determine where previously learned skills are most applicable.

- Skills or content can be taught so as to emphasize transfer potential.

2. *Recognizing the relevance of the original material or skill to a new situation*

- Main features of the material or skill (e.g., color, repetition, labelling by learners) can be stressed so they can serve as cues in a new situation.

- A variety of positive examples (in which the learning is relevant) and negative examples (in which the learning is *not* relevant) can be provided so that learners are helped to see potential relevance to new situations.

- Learning can be presented in a meaningful context so that cues in the new context can orient learners to the original situation.

- Learners can be encouraged to make *transfer hypotheses;* i.e., "I wonder if situation B is somehow or other related to or like situation A," and if so, to make a *transfer intention;* i.e., a conscious attempt to use previously learned knowledge in a new situation.

3. *Remembering the original material or skill* (or retrieving original learning via books or other references or media)

- Learning for retention can be stressed in the learning of original material.

- Appropriate sources of information relevant to the material or skill can also be learned.

- In new learning situations, hints or cues can be provided to previous learning or sources of information.

4. *Applying the original learning to a new situation*

- Opportunities can be provided for overlearning applications of content or skills in the learning of original material.

- A variety of both positive and negative examples can be used along with appropriate feedback.

- Problem solving skills can be taught.

Altman (1976) felt he was able to garner enough hints of the underlying dynamics of motivational, behavioral, and contextual factors in the transferability of vocational skills to suggest a general approach to educational programming for maximum positive transfer of skills. This series of five recommended steps for educational development includes:

1. Explicit definition of the real-world contexts toward which the educational program is oriented.

2. Analysis of relevant contexts in terms of the classes of behavioral elements involved in task performance.

3. Development of educational learning [tasks] which reconstruct behavioral elements identified in the real world, but with cost/effective educational programming rather than direct simulation as the central criterion.

4. Sequencing of educational opportunities such that an individual at each stage of his or her educational experience will have demonstrated competency on significant tasks.

5. Arranging the conditions of skill acquisition so that the unique transfer characteristics of perception, intellectual processing, memory, response, and integration of informational/motivational feedback will be realized. Emphasis is given to conditions in all facets and phases of education which include:

   Challenge — opportunity to succeed or fail against known standards.

   Fair feedback — scaled realistically, and contingent upon performance.

   Growth — an increasing individual responsibility for task selection, standards, and self-evaluation (p. xi).

Much of Altman's review leading to the formulation of these steps seemed to focus most heavily on the fifth step, arranging the conditions for skill acquisition, and on an examination of research related to those transfer characteristics especially important in the behavioral domain. In addition to Altman's suggestions relative to each of these five steps, Short *et al.* (1974) mentioned a number of provocative and important, practical suggestions that seemed to be especially relevant to the third step and that could be applied in any classroom, regardless of subject matter focus. For example, they suggested:

- The use of simulated job tasks that: provide a variety of practical applications and practice, simulate important "job conditions," and do *not* require extensive instruction or training (p. 92-93)—along with additional classroom experience with simulations of real world situations and conditions (p. 102).

- The use of cumulative models of information acquisition rather than discrete models; that is, models requiring learning of new information by attempting to reorganize information already known, rather than models requiring learning of new bits of information as separate and discrete units (p. 111)—along with the use of cumulative tests (p. 113).

- Practice in bringing together a wide variety of information in the solution of problems where the problem stimuli are temporary, fleeting, and loaded with irrelevant information (p. 113).

- Practicing skills in random sequences reflecting the random and unpredictable sequences in which job tasks, problems, facts, concepts, and procedures are normally encountered in life and work (p. 113).

In short, teaching for transfer is of paramount importance. The transfer of skills and knowledge is, or should be, a most important and explicit objective of education. Skills and knowledge intended for transfer should be taught deliberately for transfer to and use in a variety of other settings within and outside of the school.

Moreover, the development of transfer skills, as well as transferable skills, cannot be effectively accomplished if they are the objectives, personal interest, or special ability of only one or two teachers or courses in a school. These objectives can only be accomplished effectively for all students if they are pervasive and deliberate objectives adopted throughout an entire school.

Some Suggestions from Practice

The report has attempted to provide practical suggestions and examples that should help to stimulate discussion about transferable skills. In one sense it has provided information that could lead to suggestions for practice. Additionally, the project's visits and reviews of 14 educational settings provide the opportunity to turn the situation around to see what conclusions and recommendations about transferable skills could be identified from practice.

Miguel (1977) has formulated a set of emerging and tentative propositions about individual development of transferable skills and characteristics that reflect the experience of the programs visited. These are summarized below:

1. *Occupational adaptability is a dynamic aspect of human development:* Each individual's experiences are cumulative and unique.

2. *An individual's repertoire of skills is pliable:* Skills can be brought together and applied in different ways. However, skills possessed but not used can atrophy or perish.

3. *Because an individual possesses a skill required in many occupations does not necessarily insure its transferability:* However, skills and knowledge can be taught to deliberately facilitate subsequent transfer.

4. *Individuals are more likely to develop skills for occupational transferability when their educational programs include this objective as part of the explicit curriculum:* Awareness of the multiple uses of knowledge and skills should be a principal learner outcome.

5. *Developing skills in a variety of contexts enhances their transferability:* Familiarity with different, multiple contexts and many opportunities to try out one's skills in them seems to reduce "context shock" and improve transferability.

6. *Individuals must understand the multiple occupational utility of their skills and knowledge:* Students should be aware of the knowledge and skills they have acquired, the level of their development, and their multiple uses.

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7. *The values-orientation of employers and the work environment itself (and of teachers and the learning environment) determine to a great extent which skills can transfer and which cannot:* Some employment practices and their underlying beliefs, as for example, requirements for credentials, degrees, or diplomas, often have little to do with the work performed and can mitigate against skill transfer. Development of skills outside a prescribed context, such as through avocations and volunteer work, often are *not* acknowledged by schools or employers.

8. *Occupational adaptability is never completely mastered:* The success of career changes is not guaranteed by previous successful moves, though they seem to help by providing opportunities for awareness and reassessment of skills and knowledge (p. 23-26).

In addition to these propositions, Miguel also has a word for the research community and those who are interested in improving the ability of education to assist individuals to develop their transferable skills and abilities.

1. Strategies are needed for redesigning academic and vocational education curricula to provide for the development of occupational adaptability and transferable skills.

2. Innovative instructional techniques designed expressly for developing occupational adaptability and transferability are needed.

3. More needs to be known about the conditions that foster and impede the development of occupational adaptability and transfer.

4. More reliable information is needed about skills required for jobs and skills developed by schools so that greater congruence of skills can be established.

5. Students need monitoring and planning devices to help them keep track of the skills they are developing and relate those skills to a variety of occupational possibilities.

6. Counseling strategies are needed to meet the individual's continuing need for interpretation of skill transfer as it relates to new employment ventures.

7. Evaluation strategies are needed to assess the effects of learned skills on successful job moves.

8. Assessment instruments are needed to help employers determine the transferability of job candidates' skills.

9. Occupational information documents need to highlight the transferable skills and characteristics among occupations.

10. An "awareness campaign" is needed to join employers, educators, and the general public in a common understanding of the transferability of skills among occupations and other life situations.

Three Specific Examples and Prototypes

The report attempts to go a step beyond the usual recommendation for practice and research to suggest three examples of practical applications. These three examples or prototypes were developed by the project staff during the course of the project. They are *not* the result of extensive and vigorous research, development, or testing. Rather, they are suggestive of the diverse kinds of practical applications that could reflect concern for and facilitate development of occupational adaptability and transferable skills.

Example 1: A Personal Resumé

Typical resumés are characterized by lists of items intended to identify previous education and work experiences which the job seeker hopes will be relevant and interesting to a prospective employer. These credentials are normally expressed in terms of the certificates awarded by educational programs and institutions, and the titles of jobs held, together with dates and affiliations applicable to each.

In many cases, a person desiring to make a change in employment is uncertain as to how prior experiences, skills, and interests might relate to a new job situation. The resumé of such a person, patterned along conventional lines, is apt to be devoid of much useful information on skills and abilities that might transfer from previous experiences and be of great value in a new job.

The attached examples illustrate (a) a rather conventional resumé for a hypothetical person and (b) a resumé for the same person written to draw out and focus on potentially transferable skills and characteristics. In comparing and contrasting these descriptions, several points should be noted:

1. The conventional work experience credentials of this person provide little if any indication of relevant prior work experience.
2. There would be little point in such a person elaborating upon previous job activities in the context of the conventional resume; it would be logical to assume these to be irrelevant to the position desired.
3. The most notable school credential (B.A. in Philosophy) is not directly relevant.
4. Experiences external to both school and work can contribute to development of transferable skills.

Typical Resumé

Employment Desired:

A position in theater production.

Education:

B.A., Liberty University, 1970. Major in Philosophy, Minor in Theater and Art, including the following:

Typical Resumé — Continued

3 credits Acting and Theater Workshop
3 credits History of Film
8 credits Speech (including voice and diction)
9 credits Art
6 credits Painting

Employment Experience:

Secretary to the Chairman and Department Representative, Liberty University Department of Political Science, 8/68 — 5/70.

Account Clerk, Educational Indemnity Insurance Company, 8/67 — 5/68.

Sales Clerk, Liberty University Press, 9/64 — 9/66.

Clerk/Typist, New Hope University, 9/63 — 5/64.

Account Clerk, Trans-American Airlines, 9/60 — 9/63.

Personal:

Born: January 19, 1942; Single; Height: 5'7"; Weight: 125 lbs.; Excellent Health.

Resumé of Transferable Skills

Objective:

A position in theater production where unusually strong response to pressure, quick and imaginative thinking, and unusual grasp of the complicated are required.

Qualifications:

Focus well on essentials and organization in complicated situations.
Have been most effective when making decisions under pressure.
Combine aloofness and rapport for effective relations with people.
Make imaginative use of "things at hand" to decorate, create, or solve immediate problems.
Physically agile and enjoy activities requiring mental and physical dexterity.

Educational Experience:

B.A., Liberty University, June 1970. Major — Philosophy, Minor — Theater and Art.

8 credits Acting & Theater Workshop
3 credits History of Film

Resumé of Transferable Skills — Continued

8 credits Speech (including voice & diction)
9 credits Art
6 credits Painting

Related Experiences:

Organizing:

In school theater production, arranged seating, advertising, ushered, and made four costume changes for five different acting roles.

When Liberty University Press was about to lose United Nations documents account because of lack of organization, set up filing system with much cross-listing for about 1,000 titles and kept inventory including estimated sales of new titles.

Set up office systems for completely disorganized "absent-minded university professor."

High rate of success in games of chance and sports because of ability to combine concentration with "risk-tasking."

Interpersonal:

Handled "problem" telephone and in-person sales of United Nations documents.

Relate well to supervisors and co-workers. When Political Science department changed drastically, introduced new systems and helped sixty-year-old administrative assistant make adjustments.

When college play was likely to be cancelled, convinced director and cast it could be successful. (It was.)

Creativity:

Made unique visual aid—highly successful with audience, now used as example for other students.

Stripped and refinished old furniture, made wall coverings, book shelves, tables, collages, and objects d'art from "found" objects.

Did well in painting, drawing, Chinese calligraphy, and "junk" sculpture courses in college.

Physical Stamina:

For two months, traveled through four countries in Europe (including Switzerland) by bicycle at a rate of 30 miles a day.

Resumé of Transferable Skills — Continued

Spent two months tent-camping across Canada and the U.S.—hiked, fished, chopped wood, canoed, and slept in snow in mountains and out in open in desert.

Supervising:

At three different jobs, handled office when supervisors were out sick or on vacation for extended periods. Met all deadlines and emergencies.

Determination:

Financed education working full-time while attending Liberty University nights and summers for four years.

Work Experience:

Trans-America Airlines — Account Clerk — 9/60 - 9/63
New Hope University — Clerical — 9/63 - 5/64
Liberty University Press — Sales Clerk — 9/64 - 9/66
Educational Indemnity — Account Clerk — 8/67 - 5/68
Liberty University Dept. of Political Science — Secretary to Chairman
  & Dept. Representative — 8/68 - 5/70

Personal:

Born: January 19, 1942; Single; Height: 5'7"; Weight: 125 lbs.; Excellent Health.

Example 2: A Career Planning Record

To many students, career planning is very circumscribed and involves little more than extemporaneously creating a succession of *ad hoc* goals leading to a career that is thought of in terms of one occupation. Typically, an individual moves from one event to another in life, meeting standardized requirements, collecting necessary credentials, and moving toward those career options that are available as a consequence of life experiences. As a result, career goals for many secondary students are manifest in statements such as: "I need a high school diploma; I'm going to college; I'm going to be a carpenter." The underlying assumption is that, "If I get the right 'tickets', I'll be able to get my preferred job."

This state of affairs causes students to pass through many in- and out-of school experiences without taking advantage of opportunities to develop many skills that are needed in a wide variety of occupations. Even those individuals who are fortunate enough to develop such skills often are *not* aware of their usefulness. This is often evident in their concepts of themselves as persons with no marketable skills.

Career planning for secondary students can be designed in such a way as to be less limiting. Career plans should consist of something more than objectives for entry into postsecondary schools and beginning jobs. Students, at their earliest stages of career planning, should be made aware of competencies that will provide maximum career opportunities and hence high transferability. Some career education programs do help students do this, but unfortunately their actual career plans do *not* reflect nor give adequate importance to the key skills to be developed. Instead, courses are listed, training is considered, majors are chosen.

It is proposed that using transferable skills as the central organizing unit for career planning will assist students in integrating their experiences, both in and out of school; will give them a greater sense of purpose and direction; and most importantly, will give them a sense of being competent persons who have something to offer to many employers in various occupational fields. The ultimate benefit of this approach is providing maximum career flexibility without sacrificing direction and avoiding the unnecessary failure and dissatisfaction that premature closure of career choice can produce.

Using a cumulative career planning record (similar to a manila folder), students can list pertinent information for their career plans. The front and back of the folder could provide a place to record courses, work experiences, and extracurricular activities. After a student lists an item there, he/she evaluates how this item contributes or has contributed to the skills considered important to achieving his/her career objectives. This record would be a part of the total career planning services provided by the school.

Below is a sample entry. The career planning record is shown on the next page. Other information could, of course, be added as long as the transferable skills section remained the central organizing element.

Sample Entry

Helping Others

(Spring 1977) Took "Health and Patient Care" course at Career Education Center; learned how to assist patients in an emergency room of a hospital; passed Red Cross first aid requirements.

(1976-1977) Member of school's service club; learned skills in aiding and entertaining aged and infirmed adults.

(Summer 1976) Playground counselor; learned how to engage young children in interesting and constructive activities; was especially good at drawing out shy children.

(Planned for autumn 1977) Basic Psychology course; Hope to learn more about human needs and behavior; hope to develop skill in recognizing the kind of help individuals need.

Example 3: A Worker-Oriented Job Description

Job descriptions are commonly used to convey information about job positions to potential applicants. The *Dictionary of Occupational Titles* (DOT) provides some 22,000 descriptions of

CAREER PLANNING RECORD

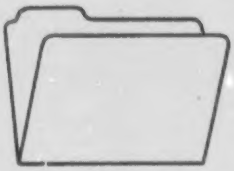
Career Objectives	
Transferable Skill Development	
Helping others*	**Communications**
Managing others	**Self-direction and Responsibility**
Problem Solving and Decision Making	**Creativity**
Writing	
Self-development (attitudes)	**Work Values**

(Back of Card)

Course Selection

Grade 9	Grade 10	Grade 11	Grade 12

Work Experience (Include volunteer work)	Extra Curricular Activities (Include hobbies)



*See previous page for sample entry.

jobs that can be found in the American work force. The pervasive language of the typical job description is job/task oriented. That is, the description defines what is accomplished by the incumbent in a specific job.

An example of a job/task oriented job description follows. It is an example of a job description from the DOT (1965) and describes the job of Real Estate Agent in terms of the process or operations that are carried out by the job incumbent.

> SALESMAN, REAL ESTATE (real estate) 250.358 real-estate agent. Rents, buys, and sells property for clients on commission basis: Studies property listings to become familiar with properties for sale. Reviews trade journals to keep informed of marketing conditions and property values. Interviews prospective clients to solicit listings. Accompanies prospects to property sites, quotes purchase price, and discusses conditions of sale or terms of lease. Draws up real estate contracts, such as deeds, leases, and mortgages and negotiates loans on property. May hold brokerage license and be designated as REAL-ESTATE BROKER (Vol. 1, p. 618).

Bruce McKinlay (1977) pointed out that "it is generally agreed that a job-oriented task analysis is more limited in its application than is the worker-oriented approach." While not everyone would agree with his conclusion, many task-oriented job descriptions are limited and do *not* effectively convey to a potential applicant information about the skills and abilities required to successfully perform the processes and procedures of the job.

While a task or process in a job description may appear to be similar to a task or process described for another job, there can be significant differences in the skills or abilities required for performance in the two jobs. The characteristics, skills, abilities, or attributes of successful performers may also vary substantially from one job to another.

An alternative mode of communicating relevant job information, independently or in conjunction with a task-oriented job description, might be a worker-oriented performance description of the critical skills, abilities, attributes, and/or characteristics required for successful performance. Such a description should facilitate the recognition of relevant skills and abilities possessed by potential job applicants.

The identification of skills that an individual has developed in other job contexts and in other non-work activities often can enhance that person's potential for occupational transfer and successful performance.

Following is an example of a worker-oriented performance description that has potential for meeting the above stated purposes.

Skills Required to Perform Effectively
As a Real Estate Agent

- Able to empathize with the emotional situation of a client involved in transferring from out of town.
- Skilled in ascertaining client's personal interests, tastes, values, and financial status and interpreting them in developing a selection/showing plan.

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- Able to foster in a client the feelings of trust, confidentiality, cooperation, and integrity.
- Able to plan and function efficiently when encountering fast changing personal or situational variables.
- Able to exhibit self-confidence, self-control, self-reliance, and adaptability in performing non-routine and randomly occurring tasks.
- Able to communicate clearly with staff and clients, in face-to-face situations and by telephone and written message.
- Skilled in reading and interpreting tables, charts, graphs, maps, and house plans.
- Able to formulate long and short term personal and career goals and manage time and resources to achieve them.
- Able to deal rationally with highly emotional or controversial situations without regard for ones own bias or prejudice.
- Able to intervene in ongoing activities and perform as staff support/backup to meet changing deadlines.

While the above example is only suggestive of an approach to describing the worker-oriented elements of skills and abilities related to a Real Estate Agent's job, it could have applicability in several different contexts.

First, it seems reasonable to assume that an individual could relate past experiences and interests, and desired future experiences, to the several skills described. Second, such a description could allow employers to identify individuals within their organization who possess the identified skills and are, therefore, candidates for transfer or promotion into the jobs. Third, such a description could provide a basis for identifying specific skills and abilities that a person needs to improve. Fourth, the process of guiding and counseling inexperienced individuals could be enhanced to the extent they might gain a better understanding of the nature of the required skills, abilities, and characteristics they need to develop for job attainment.

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APPENDIX A:

Examples of Transferable Skills and Characteristics

SUMMARY OF GENERIC SKILLS*

Mathematics Skills (11 areas; 34 skill areas; 192 sub-divisions of skills)

1. *Whole numbers:* Read, write, and count; add and subtract; multiply and divide; word problems; round off

2. *Fractions:* Read and write; add and subtract; multiply and divide; word problems

3. *Decimals:* Dollars and cents; read, write and round off; multiply and divide; add and subtract; word problems

4. *Percent:* Read and write; ratio; proportion; percentage; rate; principle

5. *Mixed operations:* Equivalents; order of operations; word problems; quick calculations; average

6. *Measure:* Read graduated scales; read verniers; time; weight; distance; capacity

7. *Metric measure:* Weight; distance; capacity; weight conversion; distance conversion; capacity conversion

8. *Geometric figures:* Forms and figures; angles; draw, sketch; perimeters; areas; volumes

9. *Drawings and graphs:* Read graphs; read scale drawings; read assembly diagrams; read schematic drawings; draw graphs; measure from scale drawings; draw to scale

10. *Algebra:* Single variable, open sentences; single variable, powers and roots; solve given formulas; integers and rationals; variables and expressions; two variable, open sentences; quadratics

11. *Calculations:* Logs; slide rule; trigonometry calculations; calculator

Communications Skills (7 areas)

12. *Words:* Plurals; prefixes, suffixes, and root words; contractions and abbreviations; dictionary; synonyms, antonyms, and homonyms; meaning and context; books

13. *Listen:* Literal comprehension; interpretive comprehension; evaluative comprehension

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* Kawula, H. J. & Smith, A. DeW. *Generic skills: Handbook of occupational information.* Prince Albert, SK: Canada Manpower and Immigration Department, Training Research and Development Station, 1975.

14. *Talk:* Pronunciation; diction and word choice; fluency; organization of ideas; ask 6W questions; give information and directions; use telephone

15. *Read I:* Literal comprehension; interpretive comprehension; evaluative comprehension

16. *Read II:* Forms; notes; letters or memos; charts and tables; manuals; Roman numberals X; Roman Numerals XXX; Roman numerals M

17. *Write I:* Phrases on forms; sentences on forms; paragraphs on forms; sentences; paragraphs; short notes; take notes

18. *Write II:* Form letters; single paragraph letters; internal memos; business letters; information reports; recommendation reports; technical reports

Interpersonal Skills (7 areas)

19. *Attending behaviors:* Physical; cognitive; reactive; covert

20. *One to one conversation:* Elementary conversation; task focused conversation; express own point of view; personable conversation; persuasive presentation

21. *Group discussion:* Preparation; presentation of information or directions; control group decision making; group maintenance; participate in group discussion; respond to information or directions; persuasive presentation

22. *Oral presentations:* Preparation; factual information; listen, respond; conceptual; persuasive; reactive

23. *Instructional communication:* Establish training; instruction; demonstration; monitor; evaluate

24. *Supervisory communication:* Give directions; demonstrate; give praise; give discipline; prepare evaluation reports

25. *Interview/counsel communication:* Preparation; closed questions; open questions; confrontation; interview customers; interview job applicants; negotiate

Reasoning Skills (9 areas)

26. *Obtain job related information:* Tools, materials, and equipment; methods and procedures; sequence; other information; theories

27. *Organize information:* Sort objects; sort data; rate; rank; develop classifications

28. *Estimate:* Time; weight; distance; area; capacity; cubic measures; costs

29. *Tasks:* Sequence; priority

30. *Objectives and methods:* Goals; activities; alternatives; criteria; priority; analysis; deduction

31. *Diagnosis:* Cause and effect relationships; possible problems; priorities; possible methods; probing questions; use senses

32. *Problem solving:* Relevant information; alternative statements; select statement; alternative solutions; select alternative

33. *Plan and coordinate:* Activities and sequences; outline plan; identify resources; estimate resources; critical activities; detailed plan; resource requisitions

34. *Implement work:* Monitor results; standards of quality; standards of quantity; standards of completion time; priorities of standards; authority and responsibility; update plans

ATTRIBUTE REQUIREMENT INVENTORY*

GENERAL VOCATIONAL CAPABILITIES

Knowledge and skills which are relevant to a wide variety of occupations but which are more occupationally specific than basic aptitudes and academic abilities.

1. *Tools:* Knowledge and skill in the use of common hand tools, portable power tools and equipment (electrical, gasoline, pneumatic, etc.) and selected special tools including delicate precision tools.
2. *Mechanical Systems:* A knowledge of elementary mechanical and physical principles and mechanical components, and skill in applying these to tasks.
3. *Stationary Machine and Equipment Operation:* Knowledge and skill in operating stationary equipment such as drill presses, lathes, book binding machines, meat slicers, milling machines, etc.
4. *Vehicular Operation:* Knowledge and skill in operating vehicles effectively, including a knowledge of vehicular motion, maintenance, and safety.
5. *Connections and Fittings:* Knowledge and skill in the use of threads, flanges, solder joints, welds, packing, washers, etc.
6. *Fluid Systems:* An understanding of leak detection measures; solid, liquid, and gas transforms; pressure; valves; safety devices; and thermostats.
7. *Measuring Instruments:* Competence in using measuring instruments including a knowledge of units of measurement and conversion of units, tolerances, and principles of measurement and estimation
8. *Electricity:* Knowledge of the principles and concepts of electricity, electro-mechanics, or electronics.

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*Descriptions abbreviated; otherwise from: Neeb, R. W., Cunningham, J. W., & Pass, J. J. *Human attribute requirements of work elements: Further development of the Occupation Analysis Inventory* (Center Research Monograph No. 7). Raleigh: North Carolina State University at Raleigh, Center for Occupational Education, 1971.

9. *Layout and Visualization:* Knowledge and skill in doing layouts and drawings including the use of drawing tools, scaling and measuring instruments, labels and dimensions, and basic geometric principles.

10. *Structures:* Knowledge of the accepted standards of structural design including such principles as maximum strength, use of building materials and insulation, maximum weather protection, and removal of damaged structures.

11. *Materials:* Knowledge of the characteristics, properties, and uses of common materials.

12. *Chemicals:* Knowledge of common chemicals, chemical components, and their reactions and effects.

13. *Foods and Cooking:* Knowledge and understanding of common foods, their preparation and composition; basic food chemistry; diets; and food sanitation.

14. *Biological Systems:* Knowledge of anatomy, physiology, and the functioning of life systems.

15. *Medical and First Aid:* Knowledge of medical and first aid practices and techniques and skill in using this knowledge in treating patients.

16. *Arithmetic Computation:* Skill in carrying out basic arithmetic operations (+, −, ÷, x) and in applying these to practical problems.

17. *Arithmetic Conventions:* Skill in using arithmetic and bookkeeping conventions including graphs, tables, charts, ledgers, etc.

18. *Clerical:* Knowledge of office routines, letter format, copying, filing procedures, and basic office machine operation (for example, typewriters, adding machines, postage meters), etc.

19. *Verbal Communication:* Skill in oral and written expression and comprehension including the ability to give effective instructions; write letters and prepare reports; defend opinions; read rapidly with high retention; understand lectures and briefings; speak effectively; etc.

20. *Sales:* Skill in assessing customer's needs and then matching customer, product, and sales technique.

21. *Service:* Knowledge of your customer's or client's rights and needs and the rules and procedures of effective service, including the ability to use this knowledge to your client's advantage and satisfaction.

22. *Dealing with Social Situations:* Skill in perceiving social situations correctly and reacting appropriately.

23. *Etiquette and Social Grace:* Knowledge of the social behavior, manners, and ceremonies established by convention as acceptable in society or in a profession, and the ability to follow these rules.

24. *Style and Grooming:* Knowledge and skill in proper attire and grooming.

COGNITIVE ABILITIES

General and relatively stable intellectual capacities involving perceiving, recognizing, remembering, conceiving, reasoning, creative thinking, judging, etc.

25. *Closure:* The ability to organize a disorganized or ambiguous visual field into a single percept or impression, with or without knowledge of any of the specific configurations contained in the field.

26. *Form Perception:* The ability to perceive pertinent detail in objects or in pictorial or graphic material; to make fine visual comparisons and discriminations among characteristics such as shapes and shadings of figures or objects and widths and lengths of lines.

27. *Perceptual Speed:* The ability to rapidly perceive pertinent detail, textual or tabular material and to rapidly perform simple visual discrimination tasks.

28. *Spatial Scanning:* Speed in visually exploring a wide or complicated field with the objective of identifying or detecting objects.

29. *Spatial Orientation:* The ability to perceive spatial patterns and to orient oneself in relation to the position and configuration of surrounding objects.

30. *Visualization:* The ability to comprehend spatial patterns in two or three dimensions and to mentally manipulate or to transform them into other spatial patterns; the ability to visulize objects of two or three dimensions; to think visually of geometric forms.

31. *Number Facility:* The ability to manipulate numbers in arithmetical operations (especially addition, subtraction, multiplication, and division) rapidly and accurately.

32. *Memory:* The ability to mentally store pertinent information and to recall it perfectly for reproduction within a short period of time (one minute to eight hours).

33. *Verbal Comprehension:* The ability to understand meanings of words and the ideas associated with them, and to use them effectively; the ability to comprehend language, to understand relationships between words, and to understand meanings of whole sentences and paragraphs.

34. *Grammar:* The ability to deal with forms and structures of words and their customary arrangement in phrases and sentences.

35. *Spelling:* The ability to use letters properly to form words. Spelling also includes the ability to distinguish between correctly spelled and misspelled words.

36. *Expressional Fluency:* The ability to rapidly put ideas into words, especially in oral or written connected discourse.

37. *Ideational Fluency:* The ability to rapidly produce ideas about a given topic where quantity rather than quality of ideas is stressed (for example, producing as many ideas as possible about a given topic in five minutes).

38. *Sensitivity to Problems:* The ability to recognize practical problems; deficiencies in courses of action or organizational plans; or implications of activities.

39. *Deductive Reasoning:* The ability to take given premises and reason to their necessary conclusion.

40. *Inductive Reasoning:* The ability to take specific sets of information and to generate or conceive of general concepts which give structure and meaning to the information; that is, finding a general concept, principle, rule, or hypothesis to explain a set of specific instances.

41. *Originality:* The ability to produce responses or ideas which are either clever or uncommon.

42. *Social Intelligence:* The ability to correctly process behavioral information obtained through social interaction.

43. *Aesthetic Judgment:* The ability to make judgments concerning the compositional organization of art objects on the basis of variations in unity, proportion, form, color, and design.

44. *Musical Aptitude:* Musical aptitude consists of a combination of sensory, psychomotor, and cognitive capabilities which have been found to underlie success in music.

PSYCHOMOTOR ABILITIES

Capacities involving bodily or muscular movement, usually in coordination with the sensory processes.

45. *Control Precision:* The ability to make rapid, yet precise, highly controlled muscular movements to adjust the position of a control mechanism (such as joysticks, levers, pedals, rudders, etc.).

46. *Multilimb Coordination:* The ability to use more than one limb (both hands, both feet, or hands and feet) simultaneously, in a coordinated manner.

47. *Reaction Time:* The ability to respond rapidly to a stimulus when it appears.

48. *Eye-Hand Coordination:* The ability to make rapid and accurate hand movements in coordination with visual stimuli.

49. *Manual Dexterity:* The ability to make rapid and accurate arm-hand movements in manipulating fairly large objects.

50. *Finger Dexterity:* The ability to make precise manipulations of small objects with the fingers.

51. *Arm-Hand Steadiness:* The ability to make precise arm-hand positioning movements and to maintain steadiness while making these movements, where strength and speed are unimportant.

52. *Explosive Strength:* The ability to apply a maximum amount of force through one or more short bursts of effort.

53. *Static Strength:* The ability to exert considerable force against external objects for a brief period, as in lifting, pushing, pulling, squeezing, carrying, etc.

54. *Dynamic Strength:* The ability to exert force repeatedly or continuously over time so as to move or support the body.

55. *Body Equilibrium:* The ability to maintain or regain body balance and orientation when equilibrium is threatened or temporarily lost, placing primary reliance on nonvisual cues.

56. *Stamina:* The ability to exert the body through continuous effort over an extended period of time (cardiovascular endurance).

SENSORY CAPACITIES

Capabilities involving use of sense organs.

57. *Near Visual Acuity:* The ability to visually discriminate detail at normal reading distance or less.

58. *Far Visual Acuity:* The ability to perceive detail at distances beyond normal reading distance.

59. *Depth Perception:* The ability to perceive distances, such as: from the observer to an object; between objects along the observer's line of vision; from the front to the back of an object so that it is seen three-dimensionally; etc.

60. *Color Discrimination:* The ability to perceive similarities or differences in colors.

61. *Auditory Acuity:* The ability to perceive relevant sound cues and to discriminate between sounds in terms of their intensity, pitch, or tonal quality.

62. *Tactual Discrimination:* The ability to discriminate characteristics of objects (such as size, shape, texture, etc.) through the use of touch.

INTERESTS

Preference for, attractions toward, or likings of various classes of activities and the contexts associated with these activities.

63. *Manual Work:* **This interest area involves a preference for the following types of work activities: (1) use of the hands and body and sometimes the use of hand tools to work, move, guide, or place objects and materials; (2) activities which are routine and usually do not require following strict standards or detailed instructions; (3) feeding or off-bearing from automatic machines, or machines operated by other workers; (4) stopping, starting, or watching the operation of machines, setting guides, pushing buttons or making other pre-determined adjustments.**

64. *Machine Work:* **Preference for work activities which involve fine work with hands, hand tools, stationary and nonstationary machines as well as activities in which the responsibility for a good job rests with the worker who must exercise good judgement in selecting, using, and caring for tools and machines.**

65. *Personal Service:* **Examples of jobs for which this interest if relevant include: model; lifeguard; restaurant hostess; bartender; doorman; telegraph messenger; etc.**

66. *Care of People or Animals:* **Preference for work activities which involve taking care of people or animals.**

67. *Clerical Work:* **Preference for work activities which involve general office work.**

68. *Inspecting and Testing:* **This interest area involves a preference for the following types of work activities: (1) examining materials and supplies and keeping inventory records; (2) using precision measuring instruments such as gauges, calipers, micrometers, or test apparatus for the purpose of grading, sorting, detecting flaws, or checking to make sure that products meet specified standards; (3) performing laboratory or other scientific tests according to standardized procedures.**

69. *Crafts and Precise Operations:* **Preference for work activities which involve the application of high level manual skills and an organized body of knowledge to one or more of a wide variety of crafts and precision operations.**

70. *Customer Services:* **Knowledge of the product or techniques of service and the ability to deal with people are important. Examples of jobs for which this interest is important include: receptionist, ticket agent, teller, sales attendant, taxi driver, cashier-checker, dispatcher, recreation facility attendant, etc.**

71. *Nursing and Related Technical Services:* **Preference for work activities which involve caring for the sick and injured and providing nursing services concerned with the prevention of illness and the promotion of good health.**

72. *Skilled Personal Services:* Examples of jobs for which this interest is important include: dressmaker, cook, barber, manicurist, cosmetologist, costumer, etc.

73. *Training:* Preference for work activities which involve the training of people, or sometimes animals, in a variety of settings and for a variety of purposes.

74. *Literacy:* This interest area involves a preference for the following types of work activities which often require a high degree of abstract-verbal ability: (1) preparing correspondence, reports, legal and business documents, or written descriptions of technical operations and processes; (2) doing creative writing and editing; (3) translating from one language to another; (4) conducting and reporting research investigations in the political, social, and psychological sciences.

75. *Numerical:* This interest area involves a preference for the following types of work activities: (1) applying the principles of accounting, cost analysis, and statistical analysis to problems of business management; (2) investigating such areas as the theoretical aspects of physics and mathematics and automatic data-processing systems and programs.

76. *Appraisal:* This interest area involves a preference for the following types of work activities: (1) applying engineering knowledge to the planning, installation, direction, and operation of projects and systems in a specific field of engineering such as civil, mechanical, chemical, electrical, or industrial; (2) carrying out appraising, analytical, or investigating work related to surveying, exploring, mining, construction, merchandising, or materials analysis.

77. *Agriculture:* This interest area involves a preference for the following types of work activities: (1) farming; (2) gardening; (3) animal herding; (4) applying the principles of chemistry, physics, biology, and genetics to scientific agriculture so as to advance man's knowledge of agricultural principles.

78. *Applied Technology:* Preference for work activities which involve applying engineering and research principles and knowledge to the design of new structures, machines, and tools, and to the development or evaluation of new techniques, processes, and products; working in the translation of ideas, sketches, or specifications into complete and accurate working plans; or applying engineering and related technical knowledge in such specialized fields as research, design, and development.

79. *Promotion and Communication:* Examples of jobs for which this interest is important include: lobbyist, business agent, placement officer, legal secretary, disc jockey, patrolman, judge, columnist, news reporter, booking agent, personnel recruiter, lawyer, public relations man, journalist, etc.

80. *Management and Supervision:* Preference for work activities which involve the formulation and administration of management policies and procedures or the supervision, control, and coordination of a wide variety of work activities.

81. *Artistic:* Preference for work activities which involve the creative expression of ideas, feelings, and moods.

82. *Sales Representative:* Preference for work activities which involve sale and installation of products or services and may include the servicing of machines or equipment sold.

83. *Music:* Preference for work activities which involve performing or creating in the field of music.

84. *Entertainment and Performing Arts:* Preference for work activities which involve entertaining others.

85. *Teaching, Counseling, and Social Work:* Examples of jobs for which this interest is important include: music teacher, caseworker, clergyman, home economist, university faculty member, athletic coach, kindergarten teacher, county agricultural agent, psychologist, etc.

86. *Medical:* Preference for work activities which involve the application of knowledge of medical science to the diagnosis, prevention, and treatment of human or animal diseases, disorders, and injuries.

NEEDS

Preferences, desires, or felt wants for various classes of outcomes and conditions which, for the respondent, are associated with satisfaction or reward. Needs are usually measured by questions concerning the examinee's preference for or strength of attraction toward specified outcomes or conditions.

87. *Ability Utilization:* The need to do work that makes full use of one's abilities; work that is challenging in terms of skill, knowledge, or mental ability. (Think in terms of the abilities of the "average man.")

88. *Achievement:* The need to feel a sense of accomplishment in one's work.

89. *Activity:* The need to keep busy through physical activity, job-related social contact, or mental activity.

90. *Advancement:* The need to occupy a position which offers opportunity for promotion or other forms of advancement.

91. *Authority:* The need to direct or supervise the activities of others.

92. *Compensation:* One's need to feel that he is being well rewarded through pay and benefits in comparison to other persons with his ability and education.

93. *Co-Workers:* The need to occupy a position which allows social interaction and the opportunity to establish friendships with one's co-workers.

94. *Creativity:* The need to apply one's initiative, ingenuity, and creativity to the work situation; to produce new and original products and ideas; to apply one's own ideas.

95. *Independence:* The need to plan, direct, and carry out one's own activities rather than be directed by others.

96. *Moral Values:* The need to avoid a work situation which conflicts with commonly accepted moral and social values.

97. *Recognition:* The need for explicit acknowledgement or appreciation for one's work accomplishments. Recognition can come from within one's organization (e.g., from management or one's peers) or from outside the organization (e.g., from the community, from professional organizations, etc.).

98. *Responsibility:* The need to use one's own judgement, to make decisions, and to be accountable for the effects of one's decisions and actions.

99. *Security:* The need to be assured that one's job or income is steady and does not depend upon seasonal fluctuations, fluctuations in the economic situation, etc.

100. *Social Service:* The need to work with people to improve their well-being; the need to do things for others.

101. *Social Status:* The need to hold a position of prestige or standing in the community by virtue of one's job position or occupation.

102. *Variety:* The need to perform a number of different job activities rather than one or two activities repeatedly; to have new tasks to perform from day to day.

103. *Working Conditions:* The need to work in an environment with acceptable or pleasant physical working conditions, including such factors as freedom from hazards, comfortable temperature, proper illumination, low noise level, necessary equipment, attractive surroundings, etc.

LIST OF ATTRIBUTES DEVELOPED BY MECHAM*

Attributes of an "aptitude" nature

1. *Verbal comprehension:* ability to understand the meaning of words and the ideas associated with them.
2. *Word fluency:* ability to rapidly produce words associated with a given word.
3. *Oral communication:* ability to communicate ideas with gestures or with spoken or written words.
4. *Numerical computation:* ability to manipulate quantative symbols rapidly and accurately, as in various arithmetic operations.
5. *Arithmetic reasoning:* ability to reason abstractly using quantitative concepts and symbols.
6. *Convergent thinking:* ability to select from possible alternative methods, the method of processing information that leads to the potentially best answer or solution to a problem.
7. *Divergent thinking:* ability to generate or conceive of new or innovative ideas or solutions to a problem.
8. *Intelligence:* the level of abstraction or symbolic complexity with which one can ultimately deal.
9. *Long term memory:* ability to learn and store pertinent information and selectively to retrieve or recall, much later in time, that which is relevant to a specific context.
10. *Short-term memory:* ability to learn and store pertinent information and selectively to retrieve or recall, within a brief period of time, that which is relevant to a specific context.
11. *Aesthetic judgement:* ability to make sensitive evaluations of artistic quality in one or more of the following: music, style, painting, sculpture, photography, architecture, etc.
12. *Visual form perception:* ability to perceive pertinent detail or configuration in a complex visual stimulus.
13. *Perceptual speed:* ability to make rapid discriminations of visual detail.

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*Mecham, R. C. & McCormick, E. J. *The rated attribute requirements of job elements in the Position Analysis Questionnaire.* Lafayette, IN: Purdue University, Occupational Research Center, 1969.

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14. *Closure:* ability to perceptually organize a chaotic or disorganized field into a single perception.
15. *Movement detection:* ability to detect physical movement of objects and to judge their direction.
16. *Spatial visualization:* ability to manipulate visual images in two or three dimensions mentally.
17. *Near visual acuity:* ability to perceive detail at normal reading distance.
18. *Far visual acuity:* ability to perceive detail at distances beyond normal reading distance.
19. *Depth perception:* ability to estimate depth of distances or objects (or to judge their physical relationships in space).
20. *Color discrimination:* ability to perceive similarities or differences in colors or in shades of the same color, or to identify certain colors.
21. *Auditory acuity:* ability to perceive relevant cues by sound.
22. *Olfactory acuity:* ability to perceive relevant cues by smell.
23. *Gustatory acuity:* ability to perceive relevant cues by taste.
24. *Tactual acuity:* ability to perceive relevant cues by touch.
25. *Body orientation:* ability to maintain body orientation with respect to balance and motion.
26. *Kinesthesis:* ability to sense position and movement of body members.
27. *Finger dexterity:* ability to manipulate small objects (with the fingers) rapidly and accurately.
28. *Manual dexterity:* ability to manipulate things with the hands.
29. *Arm/hand positioning:* ability to make precise, accurate movements of the hands and arms.
30. *Arm/hand steadiness:* ability to keep the hands and arms immobilized in a set position with minimal tremor.
31. *Continuous muscular control:* ability to exert continuous control over external devices through continual use of body limbs.
32. *Rate of arm movement:* ability to make gross, rapid arm movements.
33. *Eye-hand coordination:* ability to coordinate hand movements with visual stimuli.
34. *Eye-hand-foot coordination:* ability to move the hand and foot coordinately with each other in accordance with visual stimuli.
35. *Simple reaction time:* the period of time elapsing between the appearance of any stimulus and the initiation of an appropriate response.

36. *Response integration:* ability to rapidly perform various appropriate psychomotor responses in proper sequence.

37. *Dynamic strength:* ability to make repeated, rapid, flexing movements in which the rapid recovery from muscle strain is critical.

38. *Static strength:* ability to maintain a high level of muscular exertion for some minimum period of time.

39. *Explosive strength:* ability to expend a maximum amount of energy in one or a series of explosive or ballistic acts (as in throwing, pounding, etc.).

40. *Rate control:* ability to make continuous anticipatory motor adjustments, relative to change in speed and direction of continuous moving objects.

41. *Mechanical ability:* ability to determine the functional interrelationships of parts within a mechanical system.

Attributes of an interest or temperament nature, as characterized by different types of job situations to which people must adjust.

42. *Variety of duties:* duties often characterized by frequent change.

43. *Repetitive/short-cycle operations:* operations carried out according to set procedures or sequences.

44. *Dealing with things/objects:* preference for situations involving activities which deal with things and objects rather than activities concerned with people or the communication of ideas.

45. *Processes/machines/techniques:* situations which are nonsocial in nature, being primarily concerned with methods and procedures often of a mechanical or chemical nature.

46. *Scientific/technical activities:* using technical methods or investigating natural phenomena using scientific procedures.

47. *Dealing with people:* i.e., personal contacts beyond giving and receiving instructions.

48. *Social welfare:* working with people for their presumed good.

49. *Influencing people:* influencing opinions, attitudes, or judgements about ideas or things.

50. *Directing/controlling/planning:* operations involving the activities of others, or processes with which others are involved.

51. *Empathy:* seeing things from another person's point of view.

52. *Personal risk:* risk of physical or mental illness or injury.

53. *Conflicting/ambiguous information:* ability to tolerate and critically evaluate information of an uncertain or opposing nature.

54. *Pressure of time:* working in situations where time is a critical factor for successful job performance.

55. *Sensory alertness:* alertness over extended periods of time.

56. *Attainment of set standards:* attainment of set limits, tolerances, or set limits, tolerances, or standards.

57. *Working under specific instructions:* i.e., those that allow little or no room for independent action or judgement in working out job problems.

58. *Working alone:* working in physical isolation from others, although the activity may be integrated with that of others.

59. *Separation from family/home:* separation for extended periods of time.

60. *Stage presence:* speaking to or performing for an audience.

61. *Prestige/esteem from others:* working in stituations resulting in high regard from others.

62. *Tangible/physical end-products:* working with material elements or parts which ultimately result in a physical product.

63. *Sensory/judgmental criteria:* arriving at generalizations, judgements, or decisions which require sensory discrimination or cognitive appraisal.

64. *Measurable/verifiable criteria:* arriving at generalizations, judgments, or decisions based on known or obtainable standards, characteristics, or dimensions.

65. *Interpretation from personal viewpoint:* interpretation of feelings, ideas, or facts in terms of personal viewpoint or values.

66. *Susceptibility to fatigue:* diminished ability to do work, either physical or mental, as a consequence of previous and recent work done.

67. *Dealing with concepts/information:* preference for situations that involve conceptual or informative ideas and the possible communication of these ideas to others.

68. *Creative activities:* preference for situations involving the finding of new solutions to a problem or new modes of artistic expression.

*New attributes of an "aptitude" nature**

1. *Ideational fluency:* the ability to produce a number of ideas concerning a given topic. This attribute is only concerned with the *number* of ideas produced and does *not* extend to the quality of those ideas.

2. *Originality:* the ability to produce unusual or clever responses related to a given topic or situation. This attribute is concerned with the *degree of creativity of responses* and does not deal with the number of responses made.

3. *Problem sensitivity:* the ability to *recognize* or *identify* the *existence* of problems. This attribute does not include any of the reasoning necessary for the solution of a problem.

4. *Spatial orientation:* the ability to maintain one's orientation with respect to objects in space or to comprehend the position of objects in space with respect to the observer's position.

5. *Selective attention:* the ability to perform a task in the presence of distracting stimulation or under monotonous conditions without significant loss in efficiency.

6. *Time sharing:* the ability to utilize information obtained by shifting between two or more channels of information. The information obtained from these sources is either integrated and used as a whole or retained and used separately.

7. *Stamina:* this ability involves the capacity to maintain physical activity over *prolonged* periods of time. It is concerned with the resistance of the cardio-muscular system to breakdown.

8. *Speed of limb movement:* this ability involves the speed with which discrete movements of the arms or legs can be made. The ability deals with the speed with which the movement can be carried out after it has been initiated; it is not concerned with the speed of initiation of the movement.

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* Added to Mecham list in:

Marquardt, L. D., & McCormick, E. J. *Attribute ratings and profiles of the job elements of the Position Analysis Questionnaire (PAQ).* West Lafayette, IN: Purdue University, Department of Psychological Sciences, Occupational Research Center, June 1972.

OCCUPATIONAL SURVIVAL SKILLS*

1. Being dependable
2. Giving an honest day's work
3. Knowing what is expected of you
4. Maintaining good health
5. Managing time and materials efficiently
6. Getting along with people with a variety of personalities
7. Working as a team member
8. Understanding written information
9. Having basic writing skills
10. Knowing your own abilities, strengths and weaknesses
11. Being loyal to the organization for which you work
12. Making independent decisions
13. Using initiative and imagination
14. Locating information, materials or equipment
15. Working without close supervision
16. Working under tension or pressure
17. Adjusting to various work situations
18. Being neat and clean in appearance
19. Having basic speaking skills
20. Following safety regulations
21. Knowing how to use job materials, machines or tools
22. Being punctual
23. Having some type of specialized training
24. Organizing work activities of others
25. Following instructions
26. Having basic arithmetic skills
27. Having basic knowledge of your organization's operating procedures

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* O'Neil, S. L. *Occupational survival skills: Implications for job maintenance and mobility.* Urbana-Champaign: University of Illinois, Department of Vocational and Technical Education, 1975.

COMPOSITE LIST OF TRANSFERABLE SKILLS*

Intellectual/Aptitudinal

- Communicating
- Problem Solving
- Analyzing/Assessing
- Planning/Layout
- Organizing
- Decision Making
- Creativity/Imagination/Innovation
- Problem Identification/Definition
- Managing One's Own Time
- Basic Computation
- Logical Thinking
- Evaluating
- Ability to Relate Common Knowledge or Transfer Experiences
- Coping with the Labor Market and Job Movement
- Understanding Others
- Synthesizing
- Marshalling Available Resources
- Accommodating Multiple Demands
- Judgment
- Foresight
- Trouble Shooting
- Job Awareness
- Mechanical Aptitude
- Typing
- Accounting
- Implementing
- Self-Understanding, Awareness, Actualization
- Situational Analysis
- Assessing Environments/Situations
- Understanding Human System Interactions
- Organizational Savvy
- Conceptualization
- Generalization
- Goal Setting
- Controlling
- Quantitative Thinking
- Dealing with Work Situations
- Finance
- Tool Usage
- Bookkeeping
- Artistic Ability
- Business Sense
- Tolerance of Ambiguity

Interpersonal

- Working with, Getting along with, or Relating to Others
- Managing, Directing, or Supervising
- Empathizing, or Being Sensitive to Others
- Teaching, Training, or Instructing
- Counseling
- Motivating
- Gaining Acceptance, or Building Rapport
- Helping, or Cooperating
- Cultivating Cooperation
- Selling
- Accepting Supervision
- Delegating
- Instilling Confidence
- Team Building

Attitudinal

- Diligence, or a Positive Attitude toward the Value of Work
- Receptivity/Flexibility/Adaptability
- Determination/Perseverance
- Acceptance/Appreciation/Concern for Others

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*Wiant, A. A. *Transferable skills: The employers' viewpoint* (Info. Series No. 126). Columbus: The Ohio State University, The Center for Vocational Education, 1977.

Attitudinal (Continued)

- Responsibility
- Willingness to Learn
- Ambition/Motivation
- Self-Confidence
- Self-Discipline
- Pride
- Enthusiasm
- Patience
- Self-Actualization
- Assertiveness
- Honesty
- Loyalty
- Reliability
- Risk Taking
- Compromising
- Kindness

APPENDIX B:

Final Report of the Project's Panel of Consultants

FINAL REPORT:
WORKING PANEL OF CONSULTANTS

(Occupationally-Transferable Skills Project)

This report is divided into three sections. The first section summarizes the substantive contributions made by the Panel to the project. The second section reports some of the insights gained by individual panel members as the result of working on the project. The third section assesses the effectiveness of the "panel process" as it was utilized in this project.

The Panel consisted of:

Dr. Marcia Freedman
Conservation of Human Resources
New York, New York

Dr. Jerome Moss, Jr.
(Panel Chairperson)
Department of Vocational & Technical Education
University of Minnesota
Minneapolis, Minnesota

Dr. Calvin W. Taylor
Department of Psychology
University of Utah
Salt Lake City, Utah

I. THE PANEL'S CONTRIBUTION TO THE PROJECT

The project was designed by staff of The Center for Vocational Education, working in close cooperation with the NIE project officer. The major function of the Panel was to make suggestions to the project staff about the conduct and outcomes of six of the eight specific tasks which comprised the total project. In carrying out this function, the Panel met six different times (for a total of 12 days) between February 1976 and September 1977 at The Center for Vocational Education, Columbus, Ohio.

The following briefly summarizes the nature of the Panel's substantive contributions to each of the project tasks.

TASK 1. *Complete the production of manuals called for by a previous project.*

[The Panel was not involved in this task.]

TASK 2. *Produce four commissioned papers on key issues relating to transferable skills.*

The Panel gave advice about the desired contents of the four papers. The initial draft and first revision of each of the papers were later read and discussed, suggestions for changes were provided, and recommendations concerning publication were made.

TASK 3. *Establish and arrange for meetings of a consultant panel.*

(The Panel was formed and its six meetings were held to carry out this task.)

TASK 4. *Hold nine meetings throughout the country with representatives from industry and education to identify and discuss the importance of transferable skills in hiring and promotion decisions.*

Suggestions for the location, participants, and conduct of the meetings were made by the Panel. Reactions to the findings and conclusions derived from the meetings were also provided.

TASK 5 and 6. *Publish a catalog of data bases (Task 5) and schemes for classifying occupations (Task 6) which may be useful in subsequent research on occupational mobility.*

The Panel contributed ideas for the content, format, and dissemination of the publication.

TASK 7. *Review eight training/selection programs which rely on the recognition of transferable skills.*

The Panel explored criteria for choosing the training/selection programs to be visited by staff and reacted to a summary of the findings of the visits and their implications for the project.

TASK 8. *Explore the possibility of categorizing occupations by job tasks.*

Suggestions were made by the Panel about classification systems of job tasks such that job tasks within categories would have greater potential for transfer than tasks in different categories.

In addition to advice about the specific tasks of the project, the Panel also provided ideas and feedback to the project staff about (a) the overall conceptualization of project findings, (b) further research that might be conducted on occupationally-transferable skills, and (c) the implications of the project findings/conclusions for educational practice.

II. SOME INSIGHTS GAINED BY THE PANEL MEMBERS

The purpose of this section of the report is to present some of the insights, applicable to their separate fields of study, gained by panel members as a result of working on the project.

Vocational Education

Assume that the goals of vocational education are to maximize the satisfactions (extrinsic and intrinsic) of the individual with work and the satisfactoriness (relevance, quantity, and quality) of the individual's occupational performance to the public. Then, according to the theory of work adjustment,[1] worker satisfaction is a function of the correspondence between the needs of the individual and the need reinforcers of the job. Satisfactory performance is a function of the correspondence between the abilities of the individual and the ability requirements of the job.

The project focused upon occupational *adaptability*—the utilization of skills learned in one context (e.g., position, job or occupation) in a different context with a minimum of retraining time. Thus, the primary reason for increasing occupational adaptability, in terms of the goals of vocational education, is to enhance worker satisfactoriness. [Had the project focused on occupational *mobility*—that is, amount of and reasons for movement from position to position—then the outcomes would have been directly relevant to the improvement of worker satisfaction.]

How, then, can occupational adaptability be improved? What are the most relevant skills (abilities) to be developed by the individual? The ability requirements of occupations may be conceived of as tasks. Theoretically, each position, job or occupation can be described in terms of the tasks which comprise it. Because each occupation is, by definition, unique, some of the tasks which comprise it must be unique. Satisfactory performance in an occupation requires the ability to perform the tasks unique to that occupation as well as those tasks that may be common to other occupations. Since the improvement of occupational adaptability is *not* an end in itself, but only a means to enhance the satisfactory performance of workers on the job, the identification of tasks common to many occupations for the purpose of using them alone to develop vocational curriculums is not very productive. Instead, tasks to be taught must include those that are occupationally unique as well as those that are common if the worker is to perform satisfactorily on the job.[2] Thus, the key to the relevant skills (abilities) to be developed by the individual does *not* lie in the selection of the occupational tasks to be taught by the vocational curriculum.

The project has reinforced the notion that *all* skills are potentially transferable. That is, any occupational task that can be performed under one set of conditions is potentially performable under other conditions. The problem, then, is how can vocational education programs train for transfer? How can vocational education programs maximize the likelihood that skills to perform occupational tasks learned under one set of conditions will be appropriately utilized under different work conditions? How can the "common" tasks of occupations be recognized by the individual and appropriate skills be applied to their performance?

The skills of individuals which permit them to perform occupational tasks may be classified into four categories: psychomotor, informational, cognitive process, and affective. For the purposes of vocational education, each of these categories may be divided into skills that are prerequisite to program admission (selection) and those which are to be taught by the program. Figure 1 illustrates this matrix and provides examples of the skills within each cell.

As previously noted, occupational analyses will identify the tasks that comprise each occupation. A task analysis can then reveal the specific psychomotor and informational skills needed by the individual in order to perform adequately the significant tasks of the occupation (cells A and B).

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[1] Dawis, R. V., Lofquist, L. H., & Weiss, D. J. *A theory of work adjustment* (A Revision, Minnesota Studies in Vocational Rehabilitation: 23). Minneapolis: University of Minnesota, April 1968.

[2] Should certain tasks be selected for instruction from among all the tasks to be performed in an occupation, then such criteria as significance, perishability, safety, etc. should be utilized for selection rather than task commonality.

STATUS	PSYCHOMOTOR	INFORMATIONAL	INTELLECTUAL PROCESS	AFFECTIVE
SELECTION/ PREREQUISITE	Sensory activity, coordination, manual dexterity, etc.	"Learning tools" (RRR, etc.)	Intellectual aptitudes	Personality, coping behavior, etc.
TO BE TAUGHT	Specific occupational manipulative skills	Specific occupational information	Mediation skills (Problem solving, planning, etc.)	Work habits, attitudes, values, and interpersonal skill
	[A]	[B]	[C]	[D]

Figure 1. Classification of skills.

Consideration for occupational adaptability does not play a major part in this process. However, *after* the pertinent manipulative and informational skills are identified, as they are being organized into a curriculum for instructional purposes, some important principles of training for transfer do appear to apply. For example, "meaningfulness" apparently facilitates transfer, and the organization of content effects its "meaningfulness" to students.

In addition, the work of Guilford, Altman, and others to identify the intellectual process skills (cell C) needed to maximize stimulus and response generalization should be encouraged, for it is these mediating skills (mental processes) that appear to control the probability that other psychomotor, informational and affective skills will be transferred appropriately. It is known, for example, that practicing occupational skills in a wide variety of contexts improves the likelihood that those skills will be used flexibly on the job. Much more information (and theory) is needed about the intellectual processes so that educators can design learning experiences that will maximize the utility of all the (other) skills possessed by individuals.[3]

Occupational work habits, attitudes and values, and interpersonal skills (cell D) have been identified by lay people and professionals alike as important to occupational adaptability, presumably because a large number of these skills are common to and important for satisfactory performance in most occupations. (These skills may also be considered a part of the context in which psychomotor and informational skills are applied.) Consequently, vocational educators should learn more about the process of their formation and the most efficient means for their development.

In conclusion, to improve the effectiveness of vocational education by increasing the occupational adaptability of students, research and development activities are needed in the following areas: (a) the impact of the organization of content on transfer, (b) the identification of intellectual process skills and means for their development, and (c) the identification and means for development of appropriate work habits, attitudes and values and interpersonal skills.

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[3] The "higher" the level of occupation, the more important the process (mediating) skills appear to become.

Labor Markets

The conventional wisdom in this field conceives of skill training in occupational terms and stresses immediate applicability. In practice, manpower specialists tend to organize classes around identifiable tasks, such as typing, because they are the easiest to teach. Alternatively, they are sometimes taken in by the idea that a skill like programming can be taught in a brief, intensive course. In practice, such courses do little to improve access to programming jobs because employers prefer people out of the colleges whom they can train to whatever extent necessary on the job.

In a tight labor market, any small amount of knowledge or training is helpful in sorting people out; in a loose market—and it has been very loose indeed for many years now—skill training oriented to nonprofessional occupations is only useful if there is a close connection between the providers of training and potential employers. Such connections provide access, without which training cannot be utilized.

From participating as a member of the panel of consultants, it became clear that training can be viewed, not as a process of orderly acquisition of narrow skills or mastery of tasks (akin to what economists call specific training) but rather as a developmental process. In this view, training becomes general, both in the economist's sense which implies transferability, and in the sense that the teaching of tasks is aimed at enhancing motor, intellectual and interpersonal skills. In this scheme, tasks are simply a vehicle, and one might infer that task-learning is a secondary rather than a primary gain.

This view of training, if properly interpreted, has value for manpower specialists. It makes it possible to detach the issue of demand from the issue of the quality of the supply of workers by focusing entirely on the latter and leaving the problem of adequacy in the number and type of jobs to other policy-making arenas. Unfortunately, lack of job opportunities may seriously undermine the motivation of students and trainees, since the joy of learning for its own sake has a limited appeal in this society. "Development" is supposed to lead somewhere, and this widely-held belief presents educators with a dilemma: How can people be motivated to accept general training before they are employed when the specific training they will someday receive on the job lies in some nebulous future?

Only by working at a job can pre-employment training be put to use; in this extension of the process, however, specific, task-like skills may be narrowed rather than broadened. The work history of engineers is a case in point. The more theoretical their training, the more time it takes for them to "produce" on the typical engineering job which utilizes only a few of their competencies. The longer they stay on a particular job, the greater their trained incapacity to do related tasks—in other words, the less immediately transferable are their specific skills.

There are thus two antithetical views of development—the educator sees development in abstract, general forms, while employers see it in the increasing mastery of specific and often repetitive tasks. For this and other reasons, the notion of transferability of skills is incomplete without an understanding of the gross terms in which employers tend to establish hiring requirements; how access networks operate; the mobility patterns of workers; and the nature of internal labor markets.

Psychology

The topic of Transferable Skills and Characteristics (i.e., Transferable Attributes) is a most worthy one for investigation and serious consideration, not only by vocational education, but more importantly by *all of education* (including selection, promotion, graduation, placement, personnel and training programs, etc.). In hindsight, this topic is so basic to education and to personnel programs that it is remarkable that so little work has been done and so little is known and soundly established, as revealed time after time in this project. The absence of well-based insights is another illustration that education and training organizations have *not* traditionally called for research and development and evaluation of their programs. Instead they have relied upon the big and unfounded assumption of transferability of training—that is, of big spread effects from practically each and every education and training program.

Considering education in general, it appears that much is knowledge-focused with knowledge-testing used to evaluate the outcomes in students. Yet research on learning and forgetting (retention) curves tends to show that a high majority of the knowledge acquired will be lost rapidly by a sharp concave drop in the forgetting curve unless the knowledge attained is repeatedly reviewed or used thereafter. This forgetting-of-knowledge curve should be compared with curves on the (forgetting) retention of inner processes skills (attributes, talents, or abilities) cultivated in students in an educational program. A reasonable prediction is that the latter curves will probably be much less concave in shape and will not drop nearly as rapidly nor as far as knowledge forgetting curves. In addition, a conjecture is that more opportunities will naturally arise for the person to use the inner process skills and thus retain a higher percent of the level of functioning of each skill than in the case of knowledge retention. Furthermore, it can be predicted that less transferability occurs from knowledge-focused than from attribute-focused education. All these issues should be settled by experimentation.

One example of the lack of progress in education is the absence of any listing of attributes according to those which are more transferable (with greater spread or span-of-transfer effects). In skill or attribute-focused education, much of the attention could be on those attributes with the greatest transferability or spread effects. Then many, if not most, of those other attributes with minimal transferability could generally be postponed for training until a person got into an occupation which required that specific attribute. This approach would avoid giving large numbers of people training in a specific attribute which would, with few exceptions, not be required in their careers and not materially affect how employable, transferable, promotable, valuable, and useful they would be in their careers.

Important broad complex attributes (like teaching talent) could be investigated thoroughly through literature searches and through intensive relevant research. At present the indications are that training of new teachers is not effective in typical school-like classes where the to-be-teachers are largely listeners, being required to learn-and-return the knowledge being dispensed. Such training does *not* develop relevant teaching attributes. Also, any in-service training of teachers by the same classroom styles is not effective in improving many, if any, of the actual attributes of a teacher-in-action. The evaluation checkup of Project Impact in Iowa's Polk County indicated that their in-service training of teachers was effective in changing how persons teach in their regular classroom *only if* the in-service training included having the teacher almost immediately try out the new teaching methods with some group of students (often not their own) until they made everything work as desired with these students. Then and only then would these changes in teaching show any transfer of new training methods into their own classrooms and thereby affect their own students.

Some observations in dealing with the commissioned papers of the project should be mentioned. Though considerable rewriting may have occurred by some authors, on some points of major importance it appeared that only very minor changes were sometimes made. This minor adjustment in rewriting to a suggestion which potentially called for a major overhauling in a draft reminds one of the odds against the immediate acceptance of an unexpected suggestion or insight or new idea.

Brewster Ghiselin defines the creativeness of a contribution by how much it would require a restructuring of current insights. That is, the more creative the contribution, the more it calls for a restructuring of the total universe of man's insights and understandings. Similarly, after many lively exchanges in a research conference session, Joe McPherson once said that what finally survives and is worked into the final report of the conference tends to be the more straightforward parts of the discussion. Contrarily, the more creative parts would be less likely to survive and be incorporated in the more "sacred-appearing" printed form, because it would require a great deal of rethinking and restructuring of a receiver's ideas, education, and the whole pattern of his thoughts up to that point. In other words, the more unexpected, original, uncommon a new idea or insight was, the less likely that idea or insight would be accepted and immediately incorporated into the report. Ideas that are largely expected are readily received and written into a report, whereas the more foreign an idea is to the past experiences and thoughts of a receiver, the greater the effort and change required before it can be brought into the heart of the receiver's insights and transmitted to others in writing (let alone featuring it as a predominate part of the printed version of the report). Long established habit patterns are not easily or quickly set aside or remodeled. This helps to explain why *progress through other human beings* tends to move ahead so slowly.

In summary, the more traditional (common, usual) the idea with the higher percent of it being expected and not new, the more likely it will be both recorded in the recipient and transmitted into the final report. On the other hand, the more novel and uncommon (unexpected and creative) the suggestion, the less likely it will be transmitted into the final report (even though still retained accurately in its original form on the tape of the tape recorder).

Some educators and parents are calling for more emphasis on basic educational skills, particularly reading skills. Yet our evidence is that talking and listening skills are more important in communication activities in career and life than are reading and writing skills. Also, basic career and life skills (or talents) are more important than reading skills, at least as often taught in schools. Furthermore, these career and life skills would include a wider variety of reading skills (such as reading to spark new thoughts of one's own) than now given priority. These reading skills, in the present context, would also include the ability to "read" what is involved in a job; the ability to "read" organizations and their situations; the ability to "read" other people in the situations; and the ability to "read" oneself. Some new measures are available and others could now be constructed to get at these other kinds of "reading."

The importance of measurement and pertinent evaluation, especially well constructed new relevant measures, seems to be traditionally a low awareness area to educators and trainers. Such good new measures can increase awareness in key people and can potentially increase significantly the level of effectiveness of selection; of evaluation of jobs, situations, and programs; and of matching persons, situations, and jobs. One such new relevant measure is an assessment of the *situations* when trying to match persons and jobs. In other words, a three-way match of person and job and situation is called for rather than just a two-way match. The person who learns to read jobs, situations, and self would then know what attributes (s)he has available and functioning to a sufficient degree to determine how good the total match is. Then (s)he could decide whether the venture has a sufficiently high propect of success to commit himself or herself to that job, situation, organization, and set of supervisors and fellow workers.

Except for entrance into professional and graduate schools and into some undergraduate colleges and programs, educators (including vocational educators) often neglect to focus upon the potential impact of the *combination* of selection and training (education). Instead, their perspective often seems to be limited and to focus solely on training (even though selection may be a more potent single approach). The potential role and impact of counseling also seems to be overlooked frequently as a consequence of persons focusing so fully inward on training.

As a result of prior study and experience with this project at least two conclusions can be drawn. First, some attributes are more central in people's total set of career and life performances and therefore are needed widely and have at least moderate spread effects. These attributes could be much of the focus of education and training to obtain from such programs the most fruits, both directly and ultimately, for one's career and life. Second, selection and training programs should be as much "on target" of their ultimately desired performances as possible if transfer or spread effects are to occur and be very noticeable.

In this total area NIE could spark increased activities (a) in constructing needed new measures for identification, evaluation, and assessment purposes, (b) in basic research focused upon the issues of acquisition and retention and transferability of knowledge versus transferability of attribute processes (talents and skills), and (c) in R & D and implementation of the findings and new procedures developed.

As a psychologist with a prime focus on people, my overriding conclusion is that the topic of this project, namely Transferable Skills and Characteristics (i.e., transferable attributes), is the most important area by far in which money could be spent in education. In our own work we have called this approach talent-focused education, with emphasis on the most important and most transferable attributes. Every time this approach has been used, it has shown the most promise and the most positive research evidence compared to other approaches now available for bringing about a major improvement—even a major revolution—in education. Furthermore, it is a double-barrelled curriculum approach in which students grow simultaneously both in knowledge and in transferable attributes. The product of such an educational program is not only a knowledgeable but is also an effectively functioning, multiply-talented (or skilled) person who has many resources fully activated within. These multiple resources are transferable and make the person both useful and valuable as a citizen and highly employable, transferable, and promotable as an employee.

The funds could well be spent in supporting basic research on other intellectual and non-intellectual attributes not yet well isolated, identified, and measured which could then be elicited and developed through educational training. These include human interrelations and self insights, attributes, etc. Also important and most timely is to have funds for developing curriculum materials and approaches to cover all of the important transferable talents and other attributes that underly the production of highly effective persons and employees. Further funding should be in the implementation of all these materials when they have been sufficiently developed for use.

Finally, funding is needed on new and pertinent measuring instruments for identifying each transferable attribute, for measuring improvement in these attributes through training, and for assessing training and education programs that are focused upon important transferable attributes.

In summary, the nation would *not* make a mistake in spending an extremely high percentage of its current public and private foundation funding in educational research, development, implementation, and measurement activities focused on multiple transferable attributes in students. In fact, according to all indications the majority of the foundation funding in education would be well spent upon attribute-focused education. It would *not* be more money down the same old drain with little or no change or improvement in what happens to students in classrooms. Instead it could bring about major improvements in all fields of education and training in the nation.

III. THE EFFECTIVENESS OF THE PANEL

The different disciplinary backgrounds of the panel members brought both strengths and weaknesses to the project. There was a constant communications problem because of differences in terminology, as well as diversity of perspectives and interests. Because of this the Panel never had enough time to integrate the ideas of its members or to conceptualize interdisciplinary frameworks. The same differences in perspective, however, insured that the reactions and suggestions of the Panel to the staff were far more wide-ranging than they otherwise might have been. It was left up to the staff, who had much more time for thought and study, to integrate the ideas of the panel members. (But to help insure that some of the key insights of individual panel members were captured, the previous section of this final report was devoted to statements by each of the panelists.)

A three-member Panel worked well. Each member was kept about as active as is possible during two-three day meetings. On any one topic, at least one (and often two) of the panelists was quite active, and the others had something to contribute. Any more members might well have intensified the communications problem.

The Panel meetings were held at the right times, and about the correct number of days were spent by the Panel on the project. There were very few items on the meeting agendas for which the staff was not well prepared, and that did not seem to produce useful suggestions/reactions from one or more members of the Panel. To obtain more than suggestions/reactions from the Panel, however, e.g., interdisciplinary conceptualizations, would have required a great deal more time than provided.

The Panel and the project staff always met as one group. In enough instances, individual project staff members did talk to individual panel members between meetings about problems to indicate that some of the planned meetings might have been designed as one-on-one or small group sessions. It might even have been helpful to allow the Panel a little time to meet by itself.

The Panel found the project staff very professional and easy to work with. A high degree of rapport was developed. It probably would have been helpful, however, if the staff had provided more feedback to panel member's suggestions. Greater staff participation in the discussions would have helped sharpen the ideas of panelists and ensured their relevance.

The Panel greatly appreciated the presence of the NIE project officer. He was flexible, insightful, and made significant contributions to the improvement of the project.

The key question, of course, is whether the contributions of the Panel were worth its cost—direct support and the time of project staff and the project officer. As with many (if not most) "key" questions, it is impossible to answer with the data available to the Panel. There is no doubt that panel members made a great many useful suggestions to the staff—enough was "put on the table"—to appear to justify at least part of the cost. But whether these were assimilated into the project, and whether they will contribute to the longer range NIE program of work, or whether the suggestions might have been thought of by staff without the Panel, is not known. In any event, the experience was most pleasant, intellectually stimulating, and professionally rewarding to the panel members.

REPORTS ON OCCUPATIONALLY TRANSFERABLE SKILLS

McKinlay, B. *Characteristics of jobs that are considered common: Review of literature and research* (Info. Series No. 102), 1976. ($3.80)

A review of various approaches for classifying or clustering jobs, and their use in (a) describing the elements of commonality involved when people make career changes, and (b) understanding better the concepts of occupational adaptability and skill transfer.

Altman, J. W. *Transferability of vocational skills: Review of literature and research* (Info. Series No. 103), 1976. ($3.80)

A review of what is known about the transferability of occupational skills, describing the process or the facilitators of skill transfer.

Sjogren, D. *Occupationally transferable skills and characteristics: Review of literature and research* (Info. Series No. 105), 1977. ($2.80)

A review of what is known about the range of occupation-related skills and characteristics that could be considered transferable from one occupation to another, describing those transferable skills which are teachable in secondary and postsecondary career preparation programs.

Ashley, W. L. *Occupational information resources: A catalog of data bases and classification schemes* (Info. Series No. 104), 1977. ($18.20)

A quick and concise reference to the content of 55 existing occupational data bases and 24 job classification schemes. Abstracts of each data base and classification scheme include such information as: identification, investigator, location, documentation, access, design information, subject variables, occupation variables, and organization variables.

Wiant, A. A. *Transferable skills: The employer's viewpoint* (Info. Series No. 126), 1977.

A report of the views expressed in nine meetings across the country by groups of local community and business representatives concerning the types of transferable skills required and useful in their work settings and how a better understanding of transferable skills could improve training and occupational adaptability.

Miguel, R. J. *Developing skills for occupational transferability: Insights gained from current practice* (Info. Series No. 125), 1977.

A report of clues and suggestions gained in the review of 14 existing programs, with recommendations for practice which appear to have been successful in recognizing skill transfer and taking advantage of an individual's prior skills and experience.

Ashley, W. L., & Ammerman, H. L. *Identifying transferable skills: A task classification approach* (Special Publication No. 21), 1977.

A report of an exploratory study designed to test the usefulness of five classification schemes in identifying the transferable characteristics of tasks in diverse occupations.

Pratzner, F. C. *Occupational adaptability and transferable skills: Project final report* (Info. Series No. 129), 1977.

A summary final report, presenting and discussing an array of issues encountered in the various project activities, including a report of the project's Panel of Consultants.

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